CANADIAN TEXTILE JOURNAL

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BRADFORD
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BOSTON
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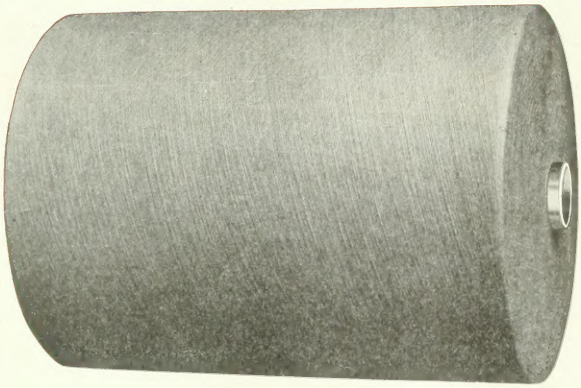

Tubes or cheeses produced on the Foster Tube Winder hold up to 3 pounds of yarn.

Used as supply for Jack Spooling, Warping, Twisting or Quilling, they save in re-creeling, waste and broken spools.

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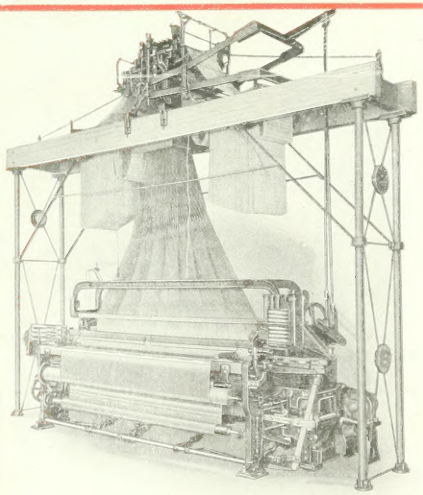

Automatic Cotton Blanket Loom

The Automatic Jacquard Cotton Blanket loom illustrated is equipped with the four-cell shuttle box, four-cell magazine, and 416-hook, double lift, double cylinder jacquard.

The action of the shuttle box is controlled through indication from jacquard card and jacquard indicator connector to box motion mechanism.

This loom is also furnished without the jacquard; cams, or dobby may be used if desired.

The operation of the magazine is controlled from the box motion.

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Crompton & Knowles Loom Works

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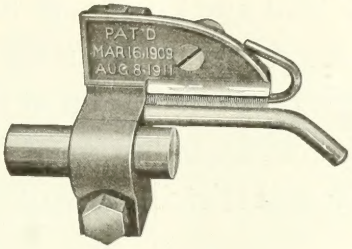

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MacColl Patent Spooler Guides
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in use up to January 1st 1922

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We have installed more water softening apparatus in Canada than any other Canadian house. If we have not discussed with you your water rectification problem, ask us to do so. Our technical trained engineers are at your service.

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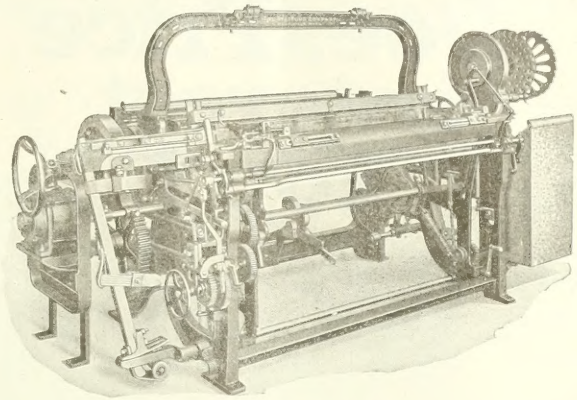

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We now build Stafford looms with either shuttle or bobbin changing automatic features to meet practically every weaving requirement.

Stafford looms increase production. They substantially reduce weaving costs. They produce fabrics unsurpassed in quality.

Stafford automatic loom are not an expense, they are an investment.

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LOOMS

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Degraco Brick and Concrete Paints.
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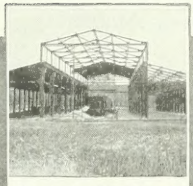

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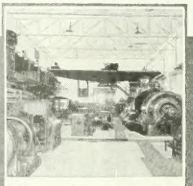

Degraco Paints, Varnishes and Enamels *are made in all colours for interiors and exteriors, for every service requirement.*

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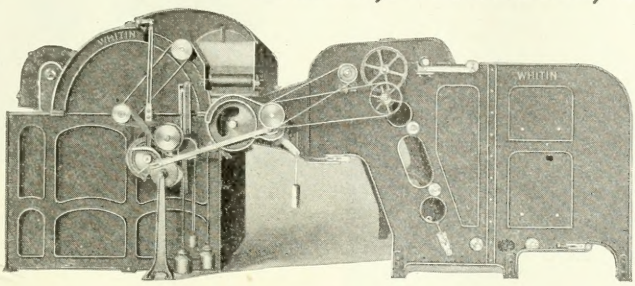

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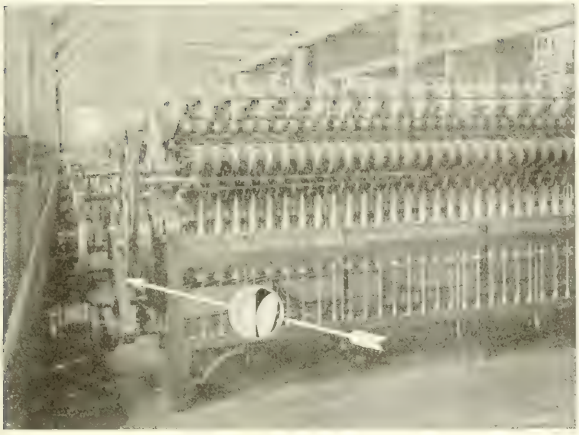

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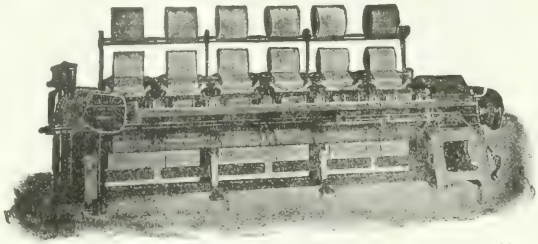

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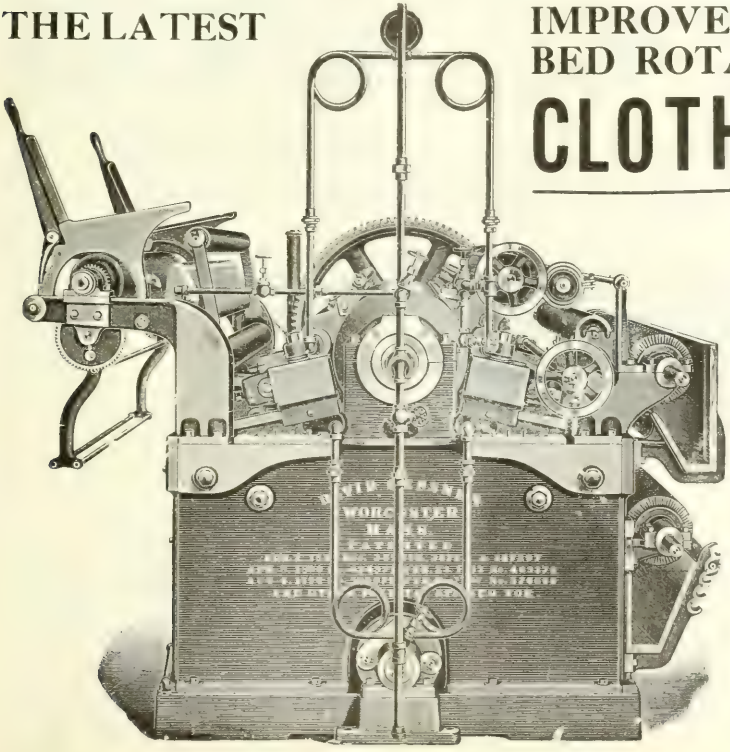

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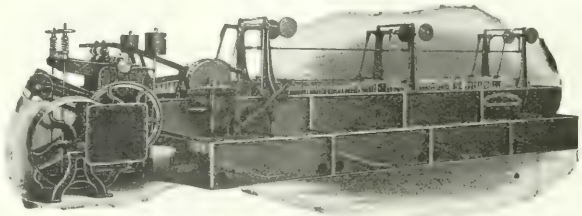

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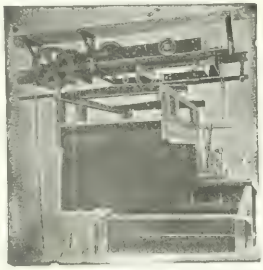

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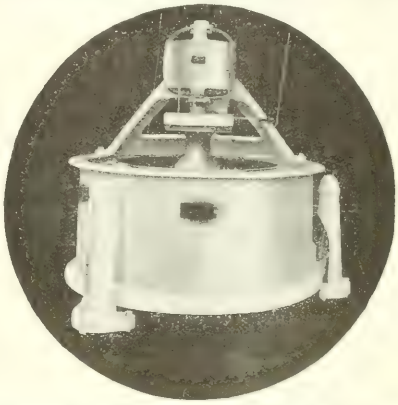

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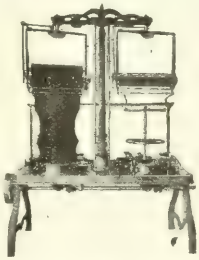

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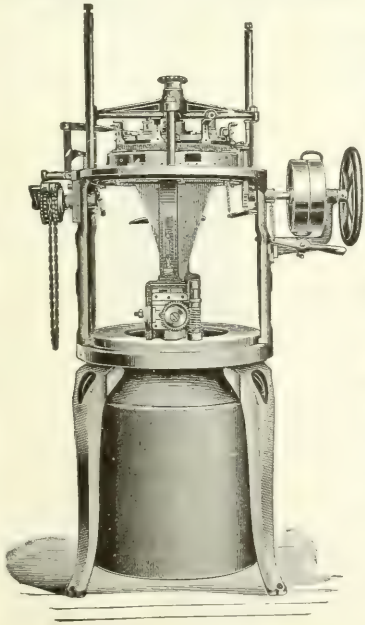

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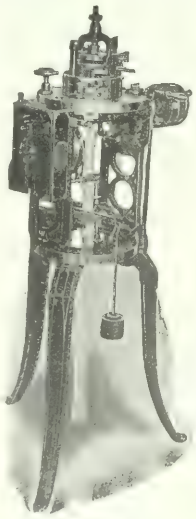

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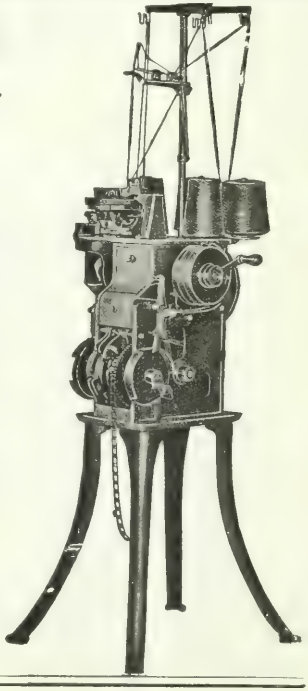

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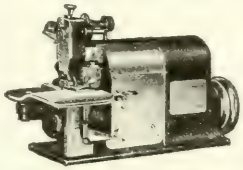

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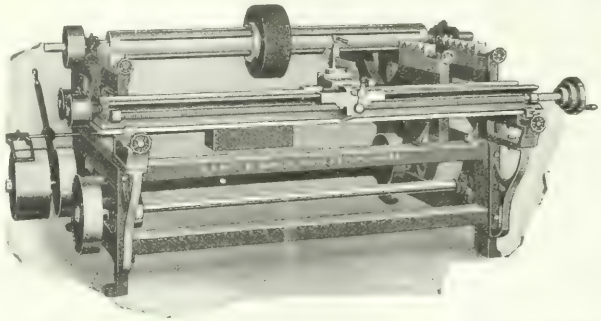

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An Educational Periodical, published Fortnightly, for the dissemination of Technical Information, with a Commentary and Review of the News and Conditions of the Textile Industry in Canada

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EDITORIAL

WHAT OF TARIFF REVISION?

Will the next session of Parliament witness a general revision of the tariff? Some people think it will, and for evidence of the faith that is in them they point to the platform of the Liberal party formulated, amid appropriate acclamations, at the self-same National Liberal Convention which elected the Hon. W.L. Mackenzie King, the present Premier, leader of the Liberal party.

Now we are quite free to admit that those who believe, on the grounds indicated, that a general tariff revision will be undertaken next session have the logic of the matter in favor of their opinion. But logic and the political art are not always too closely akin. And, for our part, we do not believe that any general tariff revision is going to form part of the work of the next session. For one thing, there is not sufficient time to collect the necessary data whereon to found such revision. It is true that under the regime of Sir Henry Dayton, the late Finance Minister, a quantity of evidence on the subject of the tariff and its incidence was collected. But we should be very surprised if this evidence were accepted by the present Government without considerable question.

For another thing, we do not believe that the Government, with the finances of the country in the condition in which they find themselves today, and with industry needing every possible stimulus, will start any dramatic interference wtih the tariff. At election times, extreme things are liable to be said on both sides with reference to the tariff as well as to other matters of political moment. But the ordinary business man never felt much fear that anything drastically radical in the way of tariff revision would eventuate as the result of the return of the Liberal party to office. We believe that in this view the ordinary business man will be justified by events, though we believe that, had the Progressives had the whip hand, the case would probably have been very different. But the personnel of the present Cabinet is, in large measure, a guarantee against any rash and reckless tariff-tinkering.

What we should not be surprised to see happen would be the setting up of a permanent tariff commission. Such a commission would not, we assume, be invested with other powers than those of investigation and report of ascertained facts. We mean that it would not have any power in the nature of legislation. Power of that kind vests in the Parliament of the Dominion alone, and that body cannot delagate its functons or transfer its responsibilities to any commission however rich in expert knowledge. But, within its own field, there is much fruitful work waiting for such a commission to do.

THE COMING MONTHS.

There are two kinds of business prophets whose predictions should always be received critically, and at a puzzling commercial conjuncture such as this, with downright scepticism. One is the super-optimist, whose geese are all swans; and the other the ultra-pessimist, whose swans are all geese. Equally with the "Blue Ruin" trumpeter is the orator of the "Be-a-Booster" type to be distrusted as a prophet in our present commercial and industrial condition. We need optimism, it is true. But, to be of any value in helping towards betterment of the situation, our optimism must be reasoned.

It is true that is is generally impossible to foretell just what the business conditions of any particular month are going to be. But in the case of business changes of marked magnitude—such changes, for example, as the occurrence of a panic or the inauguration of a period of remarkable prosperity—"coming events cast their shadows before". In other words, these great changes are foreshadowed by other events which precede them by some months and, in fact, foreshadow them. The main forerunners of either business panic or acute business depression are unduly extended bank and commercial credits, an unhealthy inventory position—that is to say an over-supply of goods without an increased market ready to absorb them—and the peculiar mental attitude which a business community,expectant of prosperity, is liable to adopt when prosperity fails. At the present moment, these conditions do not obtain in Canada. Accordingly, it is, in the highest degree, unlikely that we are going to have either a panic or prolonged depression of the most acute kind in 1922.

That does not, however, necessarily mean that we are going to have great prosperity, or even normal conditions, during the current year. Business is too bad now for much expectation of either. But what it does mean is that the worst is, almost certainly, behind us

and that times will, almost certainly, be better, considerably better, in 1922 than they were in 1921. A sudden return to prosperity is unlikely. The European situation, the continued dislocation of prices here in Canada, the impending problems of wage readjustments and transportation costs—all these are at once too grave and too far from adequate solution to make any sudden return to prosperity more than a remote possibility. But the judgment of practical men and theoretical considerations alike support the conclusion that business recovery will make substantial progress — possibly slow and probably irregular — during the year on which we have entered.

So much as to business prospects generally. As regards the textile industry, in particular, this is in a considerably more favorable condition than are many of our big industries. Nevertheless, it must be borne in mind that, as we pointed out in our last issue, for this industry to enjoy a really satisfactory measure of prosperity, a considerably greater volume of business is requisite than that which sufficed in pre-war days. We have previously summarized the main reasons why this is so. And the plain fact is that not until we get assurance of such enhanced volume of business will it be possible to look on the situation and prospects of the textile industry with entire equanimity. Textile manufacturers realize that considerable time will be requisite to bring about this condition. But, at the same time, the frame of mind with which they survey prospects for the year which has now well started on its way is one of tempered optimism.

INTER-IMPERIAL TRADE.

A delegation of the Scottish Woollen Trade Mark Association, Ltd., has been recently in Canada and has visited various industrial centres in this country. Last Tuesday, its members were in Montreal and were entertained at a luncheon by the Canadian Association of British Manufacturers and their representatives of the Montreal branch. In the course of the proceedings, Sir Charles Gordon made a very interesting speech which was suggestive from more points of view than one.

Sir Charles expressed some doubt as to whether the visitors would meet with much success from one point of view—that of securing part of the Canadian market as an outlet for the British woollen trade. We have no doubt that this remark was somewhat discouraging to the visiting delegates, but we believe it to be well founded. Canada has a tariff against imported woollen goods, and, for our part, we feel little doubt that that tariff will continue in force for many years to come. As our readers are aware, we are strongly in favor of its doing so. Even with that tariff in force, British competition, owing to divers circumstances, one of these being the recent exchange situation, has lately been a serious threat to the Canadian textile industry, and particularly to the woollen branch of it. Therefore the delegates of the Scottish Woollen Trade Mark Association should scarcely be surprised if those interested in the Canadian textile industry can hardly bring themselves altogether to wish them success in their attempt to capture part of our domestic market, none too big for the enterprise of our own manufacturers now that the prospects for export trade are so very far from favorable.

But, as Sir Charles Gordon pointed out, there is still another field of endeavor open in Canada to the Old Country textile manufacturer, if he desires to share in the Canadian market. He can establish himself here by opening up a branch factory in this country and so share in the prestige and the profit accruing from the "Made-in-Canada" talisman. This, in fact, is what many large manufacturing concerns in the United States have done, though their example has been followed by curiously few British firms.

There is, as Sir Charles Gordon said, a considerable field for inter-Imperial trade. But we are all probably agreed (at any rate in theory) that the idea of a self-supporting Empire rather than one which is largely dependent upon the foreigner, whether for raw material or for manufactured goods, is one deserving of warm support and encouragement. At the same time, the matter is one which necessitates careful handling, in order to insure that one component part of the Empire does not encroach unduly on the pet preserves of another component part—that is to say, its home market. Every country rightly looks on its own home market as forming the foundation stone, as it were, of its trade. This is but natural, and accordingly Canadian manufacturers need make no apology for being unwilling to see their British compeers take a slice of their own domestic market, unless, indeed, these choose to come and establish themselves among us and do so in that capacity.

EDITORIAL NOTES.

Textile Products Exhibition.

Manufacturers of textile products are co-operating to insure the success of the Textile Products Exhibition that is being held from February 13 to 17 in the King Edward Hotel, Toronto. Within sixteen days after the plan was opened the great majority of booths and rooms were engaged, and only a few more remain to be filled. Almost the entire mezzanine floor has been reserved for the exhibition. The show is a trade event only, and representatives will be admitted by ticket or by badge showing that the bearer is a delegate to one of the Retail Merchants' Association conventions that are being held that week. The officials conducting the Exhibition are confident that well over 3,000 will be in attendance. The buyers of business houses all over

Canada are being asked to arrange their buying trips for Exhibition week. Representatives will be present from each of the nine Provinces. The farthest West will be W. J. Bird, a retailer of Alberni, on the extreme west of Vancouver Island. The Textile Products Exhibition is the first event of its kind to be held in Canada. Similar shows have been conducted with much success in the United Kingdom and on the Continent. A large number of manufacturers are holding back their spring styles in order to show them for the first time at the Exhibition. The woollen, clothing and cotton manufacturers are bringing special speakers to address the retail conventions. The exhibitors will be hosts of the retail merchants at a banquet arranged for February 15.

Marking Goods for Canada.

The revised regulations adopted by the Dominion Government for the marking of goods imported into the Dominion are in part as follows:

Section 10. Where articles themselves incapable of being marked without injury are imported in bands, wrappers or containers, or on cores or spools, such band, wrappers, containers, cores or spools shall be marked so as to indicate the country of origin.

Section 10. Unless such articles are of a class or kind not made or produced in Canada, in which case no marking is required.

Section 12 is canceled. It read: "The name of the country of origin is required to be the English or French name of such country. Hence, for example, the use of the word 'Nippon' which is the Japanese word, the English equivalant of which is 'Japan,' will not constitute a legal indication of country of origin on Japanese merchandise."

Section. 13 The name of a manufacturer or his trademark, accompanied by the name of the country or a place in a province, State or other division of a country where the goods have been manufactured or produced will be acepted as sufficient indication of the country of origin.

Section 16. (a) Cloth and material in the web or roll shall be marked with an indication of the country of origin on the piece ticket, labor or band, or on one end of each web or roll.

Section 18. The following goods will not be required to be marked with the indication of country of origin, viz.: Goods in a crude, raw or rough state, or goods which are not intended for sale to the consumer in the condition imported, but which are merely for use in the manufacture, construction or repair of articles in Canada, this not to apply, however, to goods elsewhere specially provided for in these regulations.

Provided that on every entry at customs of goods as described in this section a statement shall be placed by the importer certlifying to facts sufficient to classify the importation within the provisions of this section.

G. R. BRAEMER JOINS AMERICAN MOISTENING COMPANY'S STAFF.

The American Moistening Company who are represented in Canada by W. J. Westaway Co., Ltd., announces that from January 1st, William G. R. Braemer of Philadelphia, becomes chief engineer of the company with headquarters in Boston and will serve in an engineering capacity pertinent to the greater development of the company's air conditioning, heating and ventilating problems. Mr. Braemer is a pioneer in this field and is an inventor of numerous United States and foreign patents in connection with air washing, humidifying, dehumidifying, cooling and drying systems. For nine years he was in charge of this branch of the business of Warren Webster and Company at Philadelphia and for the past three and a half years has been engaged as consulting engineer, specializing in air conditions.

NATIONAL ANILINE & CHEMICAL CO.

The National Aniline & Chemical Company, Inc. announces the production of a new acid green bluish tone under the designation of National Wool Green S.

The new product will prove of great value to dyers of piece goods. It possesses excellent solubility, dyes level and exhausts well from the dye-bath. It also possesses good fastness to perspiration and organic acids as well as to washing, fulling and carbonizing. It is particularly serviceable for producing mode shades in combination with other level dyeing "National" acid dyes. For shading purposes it may be added with safety to the boiling dye-bath.

National Wool Green S is recommended for dyeing worsted and wollen dress goods and yarns, and for either wool or fur felt. The general utility of this new "National" product is indicated by the fact that the dyer of silk may employ it on either weighted or unweighted silk. It is also extensively used for dyeing carpet yarns. After-treatment with bichromate somewhat improves its fastness to light and washing without materially altering the shades. The Branch offices of the Company will gladly furnish dyeings and product samples.

National Quinoline Yellow is the most recent addition to the line of acid dyes manufactured by the National Aniline & Chemical Company, Inc. National Quinoline Yellow is in all respects equal to the Quinoline or Chinoline Yellows that have been familiar to the dyestuff trade for many years. It yields very bright, greenish shades of yellow on silk or wool. It is readily soluble, possesses excellent level dyeing properties and is valuabe for dyeing in combination as well as self shades. National Quinoline Yellow is not dischargeable with hydrosulphite, and therefore will be of special interest to the printer making color discharge. Product samples and dyeing will be gladly furnished by nearest branch office.

OUR NEW TORONTO OFFICE

The address of the Toronto office of the Canadian Textile Journal has been changed from 1402 C. P. R. Building to Aladdin Building, 208 King Street West, Toronto. The telephone number still continues to be Adelaide 3310.

The Manufacture of Woolen Press Felts

A PAPER READ AT THE ANNUAL MEETING OF THE TECHNICAL SECTION OF THE PULP AND PAPER ASSOCIATION AT THE RITZ-CARLTON HOTEL, MONTREAL ON THE 25th JANUARY 1922.

By E. S. BATES, of Bates & Innes, Ltd.

The first question that arises in dealing with this subject is, "Why is sheep's wool most generally used." The chief reasons are its Felting Quality, Strength and Durability, and Resistance to Chemicals. Unlike all other fibres, such as hair and vegetable fibres, the wool fibre is a hollow tube the outside surface of which is serrated. These serrations or scales, with the hollowness of the fibre, account for the felting properties. In the course of manufacture the fibres curl and the scales interlock giving a strength not available in other fibres. The wool fibre as it comes from the sheep's back is full of natural oil, or yolk, and a portion of this oil is retained during manufacture. As it is removed the fibre tends to curl and shrink and felt. The nature of the work it is required to perform in its capacity as a porous belt carrying the liquid pulp through the stages of manufacture into paper, and allowing the water to be drawn or squeezed through without loss of pulp fibre, makes this felting quality the most important reason why wool is the fibre most generally used.

This characteristic of the wool fibre varies according to the grade. In a long, coarse wool the serrations are further apart than in a finer, short stock and therefore its felting qualities are less, although the longer fibre gives additional strength to the yarn. The closer woven and smoother the surface of the felt required the shorter and finer must be the wool used in its manufacture, so that in all the different felts used in paper manufacture, from the coarse pulp felt to the fine plate felt, or the fine book machine felt, many grades of wool are brought into use, with a great variation in length of staple, diameter of fibre, felting quality, etc.

Grades of Wool.

Wools from different breeds of sheep differ in length, diameter and strength of staple. In fact, each fleece contains upwards of fifteen to twenty distinct grades of fibre. The grading of wool is therefore a very important part of woolen manufacture. Much of this grading is performed before the wool is marketed, and mills are generally able to purchase, in any quantities required, approximately the types required. Generally speaking, a certain type of wool is bought either in the fleece, skirted, or sorted in a general way and either in the grease, that is, the natural state, or scoured. Grades are classed in a variety of ways. The British system is based on worsted counts, and a certain wool is said to be 36's or 40's, or 60's or 70's, according to its spinning properties, the basis being that, say a 40's quality, is supposed to spin into a yarn 40 x 560 yards in length to the pound of wool, under fixed atmospheric conditions of 19 per cent regain of moisture from bone-dry condition. The American method of classifying wools is somewhat different, presumed to have been developed from the mixed-blood sheep, that is, mixture of the Merino and English breeds. Under this system wools are classified as Braid, Common Low Quarter, ¼ Blood, ⅜ Blood, ½ Blood and Fine. It may be useful to some of you to know the comparative grades. Braid corresponds with the British grade 36's and Canadian Lustre, Common with British 40's & Canadian Coarse or Low Quarter, Low Blood with British 44's-46's & Canadian Low Medium, ¼ Blood with British 50's & Canadian Medium, ⅜ Blood with British 56's and Canadian Fine Medium, ½ Blood with British 60's and Canadian Fine, and American Fine with British 64's-66's and Canadian Extra Fine. The wools used in making felts vary from Low Quarter used generally in manufacture of pulp felts to ¼ Blood used generally in 1st and 2nd press news machine felts, to ⅜ Blood or 56's used in finer felts. Grades are mixed to produce desired results, so that it is impossible to more than generalize in saying what exact grades are used in certain felts. However, the above classification is sufficiently explanatory.

Wools are available to the felt manufacturers in the fleece, skirted, that is with the outer edges removed, or graded, and either in the grease as it is removed from the sheep, or scoured, and is purchased by them in all these conditions according as the offering pleases. The wool buyer must know the types he requires, and must look for evenness of quality, strength of fibre, cleanliness, and if the wool is in the grease must be able to estimate shrinkage between that condition and the scoured state. Wools in the grease lose from 25 to 60 per cent in scouring according to type and cleanliness, that is freedom from extraneous dirt. Some wools contain more natural oil than others, fine wools a much larger percentage than coarse wools. So that the buyer must know the "handle" of wools.

Felt wools are produced in many countries. The Eastern Canadian wools contain many grades that are adaptable. England, New Zealand and South America furnish the most of the world's supply. The distribution of this supply has been remarkably developed, so that the woolen manufacturer in Canada has available a supply gathered from all corners of the earth, and by dealing with old-established wool brokers in the wool centres, like London, Bradford, or Boston, is enabled to buy from small hand samples and to know that the shipment will come through as nearly like the sample in uniformity as it is possible to get.

Wool Preparation.

Assuming that fleece wool in the grease has been purchased, the first operation is sorting, that is classifying the different qualities in the fleece, according to the grading required. Then comes scouring. This process is carried out in a series of connected bowls containing warm water through which the wool is raked automatically, coming out on a revolving apron which carries it through the dryer. When dried the wool is allowed to condition, that is to regain normal moisture content, about 12½ per cent. from bone-dry condition in Canada.

The Batch is then assembled comprising the mixture of grades required to make the desired quality of felt. A small quantity of oil is added to facilitate the passage of the fibres through subsequent processes. It is then passed through the picker where the fibres are disent-

angled into a soft fluffy mass preparatory to the most important operation of Carding.

Carding further disentangles the fibres, straightening them out parallel to each other and forming the yarn structure. The card consists of a series of three or four large and small cylinders, covered with wire clothing. The base of the wire is attached to leather covering the cylinder, and the points of the wire stick out evenly and vertically from the cylinder. These cylinders revolve in close proximity to one another at varying speeds. The operation is continuous and the wool feeds through between these rolls, until the soft fluffy mass of wool fed into the breaker end of the card emerges from the finisher end in the form of roving, a very loose rope to the required weight, ready to be spun into yarn. This is the basic operation in the construction of woolen cloth.

The next operation is Spinning. In woolen manufacture this is accomplished on the Mule. The process consists of the drawing or stretching of the roving, and spinning or twisting it into yarns. The operation is mechanical. The mechanism is finely regulated, so that the exact draw and twist required can be performed and controlled by definite calculation.

Weaving.

The wool has now been prepared for weaving into the form of a felt. Up to this point the machinery used has been regular woolen mill equipment. But the demands of the paper industry have compelled the construction of special machinery for the operations to follow to produce the heavy-weight, wide felt required on modern paper machines. Mills are generally equipped with a battery of special looms for the somewhat standardized pulp and wet felts, with looms of varying widths for other felts.

The yarn, after being prepared for the cloth to be made, twisted into several ply in the case of pulp felts, is laid out by the Warper according to specifications of length of felt, or series of felts to be made, as width, number of strands of warp yarn to the inch, etc., and is wound on to a warp beam which fits onto the back of the loom. The warp is drawn across the loom, each strand through a heddle, or wire, attached in such a way to the harness, as to automatically rise or fall as desired in the weaving operation. This rising or falling of the warp strands in prescribed fashion forms a shed through which the weft, or filling strands, are passed automatically. The required weave, whether plain, broken twill, basket, or otherwise, is regulated automatically. The warp yarns fold over the weft which is forced forward into place by the Lay, thereby producing the felt or cloth, in a consecutive series of interlocked folds of warp and weft. The width is controlled and maintained evenly by the Reed, an upright comb in the lay, through which the warp yarns have been drawn, and which forces the weft yarns into place.

Necessarily, owing to the heavy-weight fabric to be woven, felt looms are much more strongly built than the ordinary woolen loom. Widths vary from 36 inch reed space to 480 inch, and wider to accomodate the tendency among paper makers to use longer felts. The 36-inch loom is used in the weaving of small jackets, while the very wide looms are used mainly for weaving the endless felt. The limit here is at present around 65 feet in length which in the woven endless felt is the width as lying in the loom. The majority of work however, is done on looms between 175 and 335 inch reed space, the average felt loom being about 280 inches in reed space. The weaving of felts endless is becoming more popular, thereby overcoming the joining process, so that the tendency is toward larger looms. The tension required on the warp yarn and the power required to operate the weft mechanism necessitate a very strongly constructed loom frame so that the modern felt loom is quite a formidable piece of machinery for a woolen mill.

All felts are used as an endless belt and must either be woven as such or joined. The single cloth, that is the felt that has to be joined after being woven, is the simpler, and up to the average widths felts can be woven in this way. Taking an average felt, say 43 ft. by 160 inches, wet felt for news machines, the warp is laid out or dressed with the necessary number of strands to take a filling to make approximately 2½ ounces per square foot finished weight. As the felt is to be 43 ft. by 160 inches when stretched to length on the paper machine, the felt is made shorter and wider, finished size, in the woolen mill. It will be woven in a 312 inch loom 280 inches wide in the reed. Eight to ten picks of filling per inch are woven, a selvedge of about 2½ inches is made and the felt is cut from the loom about 47 feet long, with a one foot fringe allowed on each end for splicing. Four to six felts of the same type and of varying widths can be woven from the same warp without changing the loom, and therefore saving much loss of time. Felts can be woven single to any length, but the width is a determining factor depending upon the available loom width. Woven-endless felts are limited by the length wanted and can be woven to any width.

Woven-Endless Felts.

With a few slight changes made in the loom, a double cloth must be woven to make a woven-endless felt. The laying out of the cloth preparatory to weaving is similar to the single felt, except that the warp strands of the single woven felt become the filling strands of the woven-endless felt. Great care must be taken that the edges are made even, and that the take-up of the upper and lower cloths is performed evenly under uniform tension, so that the weaving in of the warp strands, now filling, will be done evenly in both cloths. As the edges of the cloth as woven in the loom are crosswise of the felt when in operation on the paper machine it is obvious that perfect edges must be woven. This is practically overcome by patent attachments that hold the edges of the felt in place, and with due care from the weaver there is only slight liability of looped or loose edges.

The chief difficulty with felts woven endless is the lack of selvedge. When taken from the loom the sides of the felt are usually sewn or whipped, and if the felt has been made correctly these sides run satisfactorily. However, the strong, evenly woven, reinforced sides of the single-woven felts cannot be duplicated on the woven-endless felt, and very often this factor condemns the latter in the eyes of the paper maker.

Marking Felts.

Marking or Stripe felts are made by the single cloth method with part of the warp of filling yarns of greater diameter and harder twist than the others, the designs being produced by these yarns in combination with a certain weave, such as a check, twill or herring-bone effect. However, the engraved roll is taking the place of the marking felt except where deep impressions have to be made or where the design cannot be too regular.

Joining or Splicing.

Having been measured off to the correct length at the loom the felts are placed over long tables for Burling. All knots are untied, not cut, and the ends are spliced by hand. Mispicks, floats, double picks, etc., are fixed, and the felt is made as nearly perfect as possible. It is then drawn over an elevated roller or Perch and examined against the light. If a woven-endless felt it is then ready to be sent to the finishing room, or to the joining room if a single-woven felt.

Manufacture of Felts.

Joining or Splicing is exactly what the name implies. The work consists of taking the two fringes of warp ends of the single felt and joining them together to make an endless belt. It has to be done so as not only to be unnoticeable but so that it will be practically the same and will wear as well as if it had actually been woven endless in the lom. The operation requires skill. The felt must be joined exactly true to prevent it running obliquely on the paper machine. Experience is necessary to know how wide to make the splice, how tight or how loose it should be, how far to splice by, how close to shear, etc.

The felt is drawn over a slanting table and the two ends are fastened across the centre of the table. The ends are ravelled down to where the weaving is perfect and the filling threads are brought together in proper formation. Starting at one end of the felt the joiner picks up the first warp thread of each end and ties them with a knot six inches from each end of the felt. After doing this she follows along the proper warp thread for about six inches, picks out the warp thread at this point and pulls it through knot and all. Then she ties the next warp threads in the same manner and pulls the knot six inches down in the other direction. The next warp threads are tied and drawn upwards about two inches, and so with the fourth drawn to the lower side, and so on across the felt. In this way the places where the tied warp threads emerge are staggered or evenly distributed. This done across the felt the tops are cut off the loops which have been drawn through leaving free ends about one inch long sticking out from the felt. These projecting ends are spliced by, the loose ends are cut off, and the felt is joined. A detailed description of this operation has been given as this method might easily be employed in the mills for mending holes, one mender being trained who might become very expert, thereby saving time and clothing.

Woven and Pressed-Felt Jackets.

Woven jackets can be made on the narrow felt looms. They are woven endless in a 3-5 ply cloth. The yarn is fine, made from fine quality wools, and the warp is laid out with a great many more strands to the inch than felts, and woven with a great many more picks to the inch. The sizes required finished are easily calculated in the lay-out, and the finishing follows somewhat after the regular methods to be described later.

Pressed felt jackets are made by taking the web off the finisher end of the card before being made into roving, and rolling it over a drum to the necessary thickness, and hardening, felting and shrinking to the required thickness, diameter and width finished. These operations require special equipment and great accuracy, but data are available enabling the manufacturer to determine shrinkages and thereby produce the evenly felted jacket with which you are all familiar.

Finishing.

While all the previous operations of laying the structure of the felt are most important it is here that the real work of fitting it for its ultimate uses on the paper machine are performed. The various stocks used in the manufacture of felts give the differently desired results, but the finishing operations are practically the same for all. They include scouring and fulling, called wet finishing, and drying, napping or singeing, stretching and measuring, called dry finishing. It is in the wet finishing operations where the felt receives its felting and characteristic qualities of hardness, softness, resilience, roughness, smoothness, slaziness, etc., and where the size and tension are controlled.

As received in the finishing room the felt appears a dirty, loosely woven, cloth. It contains the oil used in the wool preparatory processes and such other dirt as it has accumulated. It has been loosely woven to a predetermined width and length, wider and longer, as stated previously, than the required measurements finished. The first operation is the Fulling. Here the cloth is felted and shrunk to the required degree. The operation consists of wetting the cloth with fulling solution adapted for the reduction of the oil, and to the quality of wool used, the amount of twist in the yarn, the weave, the desired number of warp and filling threads per inch finished, the tension, the nap and "feel" required on the felt, etc., etc. The cloth is revolved at determined speed between heavy wooden rollrs, folded loosely and evenly to prevent mill wrinkles and to ensure even shrinking. It is watched carefully, taken out several times during the operation for measuring and refolding, and run for from 30 to 90 minutes until it has attained the desired state. The operation is one that requires much experience and skill. While the experienced finisher has general rules to go by each felt demands individual attention. The size as taken from the fulling mill is shorter and wider than that required, to allow for length tension and width tension, that is the difference in lengths and widths between those as the felt is lying on the floor with no stretch to it and those in running.

With the necessary size obtained the cloth is ready to be Scoured. No fulling or felting is wanted in this operation; so as the fulling solution has acted chemically on the oil and other outside substance, a non-alkali, good lather-forming soap is used. The goods are thoroughly scoured and rinsed, then de-watered and dried.

This completes the manufacturing operations in the case of pulp felts, except that in the drying operation the felt is stretched to the required length and width, approximating here the tension it undergoes on the pulp machine, and therefore attaining the exact size wanted. The felting and shrinking of the wool fibres in the fulling and scouring operations has already given a "cover" of nap to the felt, which fills the spaces between the warp and filling yarns and gives the pick-up quality to the felt. In pulp felts strength and porosity are the desired factors. The yarns are very strong, twisted strands and their size necessitates fairly large spaces between the warp and filling threads. These spaces must be filled to permit the easy drainage of water from the pulp without allowing the pulp fibre to get through. If too much cover or nap has been given the felts will fill up quickly and give endless trouble. It is clear therefore that the two factors the felt maker must keep in mind in making pulp felts are sufficient strength to stand the tension, pressure and kicking, and the porosity of the felt.

More cover is required on most other felts to give a greater quality of pick-up, a better diffused porosity, softness, smoothness and finish. This is accomplished on the Napper or Gig. The felt is stretched tightly across the surface of a cylinder fitted with teasels or wires. As the felt revolves slowly against the direction of the rapidly revolving cylinder the attendant carefully applies the surface of the felt against these teasels which pull out the fibres on to the face of the felt. This has to be done uniformly and in such a way as not to injure the felt. The lighter the felt the harder it is to nap. The ordinary wet felt is comparatively simple, but a great degree of accuracy is required with all felts to get the nap even and uniform. The third press news felt also requires care to obtain the necessary smooth surface required to give surface to the paper.

This completes the manufacturing operations. Felts should be allowed a week or so to "set" then should be re-measured and stretched before delivery to the paper mill. The folding is done in a manner best suited to the handling of the felt on the paper or pulp machine, as the case may be.

In wet press and second press news machines felts, the qualities of strength, pick-up and porosity are what are desired. Necessarily a strong course wool is used. The third press news felt must add finish as an important factor, so that a finer quality wool and finer yarn is used, also a smoother weave, to ensure a smooth even surface to the felt. This relation exists between these felts on each class of machines for the various main grades of paper. Naturally there could be even more variety, and perhaps this feature is given insufficient attention, but standardization and speed are determining factors. The result is that the felt maker looks for the average uses for which each grade of felt is required and endeavors to fill the conditions met with there.

Pulp felts and news machine felts are fairly standardized. Conditions in different mills vary slightly, but hardly sufficiently to affect the operation of felts. As the higher speed machines have been developed conditions have necessitated stronger, therefore coarser, wools, larger yarns, less strands of warp and filling per inch, greater porosity, etc., and therefore standards have changed. These are all determining factors and if properly understood the felt maker should meet conditions. Some mills "nurse" felts, other "drive" them, hence varying "runs" in different mills; but with presses and rolls running true, and with equal conditions of operation standard "runs" can be obtained.

The Performance of Felts.

The variation in "runs" between individual felts made in a series and run on the same machine has always been difficult to understand. Here the "human factor" enters, but it can be taken for granted that the felt maker has all the evidence on his side where such variation exists. The wide-awake felt manufacturer will notice any weakness in the felt before it leaves his mill. His facilities for detection of such are almost infallible, and he can make better use of a spoiled felt before it leaves his mill than after it has been returned from a paper mill perhaps after several days running.

Mill wrinkles produced in fulling give endless trouble on the paper machine, but a felt containing them should never leave the mill. Uneven joining is another fault, easily detected. But, if the felt-maker has not determined the strength required, the degree of porosity, the resilience, the hardness or softness, and the finish, you will have trouble and he will hear about it. These are factors every paper mill should be interested in determining, and they can be determined to a very useful degree. The exact measurements of felts required should be known, that is the exact lengths and widths on machines with allowances for stretch and shrinkage, leaving it to the felt-maker to know the floor size. A properly made felt of the proper size to suit the machine for which it has been built should first lengthen and narrow out slightly after it has been wetted and stretched and run for a few hours, then gradually widen out until set, and should hold this size fairly accurately until worn out. The variation in quality of stock and unavoidable mechanical imperfections prevent this from being absolute, but this is the desired result. This applies to all felts in more or less degree according to their quality. The finer quality and weave a felt is, the more set it should be when it leaves the felt mill, and therefore there should be less variation on the paper machine.

Strength of Felts.

The element of strength in a pulp or paper machine felt is determined by the conditions to be met with in use. As previously stated the qualities of a felt are strength, porosity, pick-up, hardness, softenss, smoothness and finish. The tensile strength is dependent largely upon the degree of other qualities desired. Naturally the paper-maker is looking for the strongest felt he can get to enable long runs, but his conditions also compel him to insist upon the other qualities, and these qualities of nap, porosity, and finish produce limitations on the felt-maker in his consideration of tensile strength. "Felt-marking" is a fault that must be guarded against continually. This factor places a decided limitation on the felt-maker.

The quality of strength is determined by the length and strength of the wool fibre, the diameter of the single yarn, the twist of the yarn, the ply of the yarn, the number of strands per inch of warp and filling, the type of weave, and the finish required on the felt. Where strength and porosity are the principal qualities considered, as in the case of pulp and wet press news machine felts, the ordinary "one and one" plain weave is employed. This gives porosity. In pulp felts, where marking or crushing of the stock is of only passing importance, a long fibre stock is used, tightly twisted in the single, and then again twisted to from 4 to 10 ply yarn in the warp and 2 to 6 ply in the filling. Little nap is required, other than the cover obtained in the fulling operation. But in the news felt, while a somewhat similar wool can be used, the felt must be softer, with more cover or nap, and, having to do with a much thinner stock, the felt must be much smaller mesh, requiring single yarn of medium twist to prevent crushing, and the plain weave is employed to give the desired porosity. Naturally the tensile strength is less than in the case of pulp felts, but the relation here between tensile strength and porosity and finish of the felt is the item of greatest consideration.

Better Service by Co-operation.

As smoothness and finish become of greater importance finer wool must be used, yarns become smaller in diameter, the weave is changed to a smooth flat broken twill, porousness becomes an item of less consideration, and softness, cover and finish of greater importance. In these days of competition and speeded production the danger of sacrificing these other qualities for strength and increased runs is very great. Of course, the desired

result is a strong, smooth-running felt. Perhaps the stress laid upon the relation of desired qualities will emphasise the importance the felt-maker attaches to intelligent criticism of his felts in operation. And perhaps you will look for faults in this relation in your consideration of and report on felts giving unsatisfactory service. Co-operation of this nature will produce results in more standardized felts, longer runs and better service.

The high-speed machines developed in recent years have called for increased tensile strength in the felt, and increased porosity, particularly in the wet and second press felts, but the limitation has persisted in the necessity for providing a napped felt to provide pick-up and sieve qualities and a sufficiently soft surface to prevent crushing. Increased suction has also been a factor to contend with. The demands of speeded-up production have been difficult to contend with, owing to that relationship between strength, porosity and finish which the felt-maker must always keep in mind.

Naturally, felts fill up and require washing, frequently or otherwise as the case may be, according to the nearness to perfection the felt has been made in the relationship of the desired qualities. However, this subject is left for your discussion and our enlightenment. There is no doubt that a better understanding of this relationship by paper-men, and the passing on of information to the felt-maker will tend towards perfection, and do away with many troubles encountered with felts in operation. So far as the paper maker is concerned this relationship is the cause-all and end-all of felts. If the felt-maker with only a limited and cursory knowledge of paper-making has to grope round for his information his experimenting might prove expensive and unproductive of results. It is to everyone's advantage to effect all possible improvements.

Textile Machinery Development.

We have for some time had it in mind to print—as we now do below—the paper on the above subject given by Mr. Arthur J. Holt, of Messrs. Platt Bros. and Co's textile machinery works, Aldham, Eng., at the World Cotton Conference held last year. Both historically and practically, the paper seems to us to be of great interest and importance.—Ed. C. T. J.

Mr. Holt, dealing with cotton machinery and equipment said the subject was a suitable one for the writer to deal with, seeing that he had served 50 years in the textile machinery business, in the works or in visiting cotton mills in Eastern Europe, the Far East, and India, as well as in this country and America. In writing as to the cotton mills of the future, he had considered it well to take a general retrospective view of what had been or attempted to be done since the days of Arkwright, and to refer to notable inventions, more especially those which have held their ground and remained in use as standards to this day. Also to note, so far as the principles of these inventions were concerned, in what direction they had been developed, and to consider for what cause some of the inventions had failed to stand the test of practical working, also in what direction they might expect to obtain still further improvements in the machinery for treating the cotton from the cotton gin to the spinning machine. The inception of cotton spinning machinery, its gradual evolution and the present state of comparative perfection had not, with very few exceptions, been brought about by learned scientists or professors, but by the practical men of all grades, ranging from the intelligent workman, the carder, the spinner, the mill manager, and the machine maker. Progress in these directions had been slow but constant, and mainly the result of actual practical working, and those improvements and developments had shown themselves more prominently in the districts where cotton spinning machinery had its inception, and where it had grown to be the very hub or centre of the cotton spinning and manufacturing industry of the world.

First Spinning Frame.

The first continuous spinning machine, and the first to use the roller system of drafting, known as the water twist frame, was patented in 1769 by Richard Arkwright who was by trade a barber. The machine was put to work in 1771. It was geared direct from the water wheel through shafting made of square wood beams with cast iron cog wheels, and through an upright shaft; the power was conveyed by a large wooden drum at the bottom of this shaft, and by means of a broad leather belt to drive (what we should term a double-geared spinning frame), half the spindles being on each side of the drum. The machine had, as is usual to-day, spindles on each side, and in each of the four sections were six boxes of four spindles, 24 spindles—total,96 spindles per machine. The reason for the division into boxes of four spindles only was no doubt, because the roving presented to it from the lantern frame was such irregular quality and so small in quantity, that it was found advisable to be in a position to stop the spindles in sections, without stopping the whole machine at one time. There were three lines of fluted bottom rollers and three lines of covered leather top rollers, each line having graduated dead weights. The flyers and bobbins, and the drag or brake on the bobbin, were practically the same as is used on flyer frames to this day, the spindles being driven by a broad strap direct from the central drum before mentioned, a method still used in modern silk-twisting machinery. He had described this machine somewhat fully so as to emphasise the fact that the principles of roller drafting and of putting twist into the bundles of fibres was in use even to-day, but in iron and steel construction, accurate workmanship and many refinements "have replaced the wooden construction and blacksmiths work of 150 years ago. The water twist frame was followed about the year 1823 by the ring spinning frame, invented by John Thorpe, an American, and about the year 1829 by the Danforth cap frame, introduced into this country by a Mr. Hutchinson.

The cap frame did not appear to have made any standing in the cotton trade, although it was still used by worsted spinners. It was interesting to note (from Dr. Ure's book, 1836) that the throstle frames were seldom less than 144 spindles each, and one girl could mind two frames, viz., 288 spindles, and produce 24 hanks per spindle counts 34's, per week of 6½ hours, and in the new Manchester mills even 30 hanks. When spinning 32's the front roller 1 in. diameter runs 64 revolutions and spindles 4,500.

New Invention.

In 1832 R. Montgomery took out a patent for what was known as the Montgomery throstle, a communication from an American inventor. In this machine the flyer was a double one, held in bearings both top and bottom, this flyer being driven by the usual band wharve. The spindle on which the bobbin was placed was not driven, but dragged round by the flyer. The latest development of the throstle was the patent Ashworth long collars, which was at its zenith about the year 1880: by its use a spindle speed of about 6,000 revolutions with 2½in. lift was practicable.

The invention of the ring spinning system by John Thorpe was destined to put both the flyer spinning system and the Danforth cap frame in the background, but the ring system did not attain any considerable measure of success until many years of developments of the various details, notably the ring and the spindle. The invention of the Sawyer spindle, in which the upper bearing of the spindle was situated high up inside the bobbin, gave greater stability to the spindle and made a higher spindle speed and steadier running practicable.

The Sawyer spindle was superseded by the Rabbeth and Altwood, patented 1867, and this type has remained in use to this day. Its development and perfection had been the object of innumerable inventors, notably such details as the flexible bolster, special oiling arrangement, such as the removable oil cup, oil spout, and holding-down latch. Every detail of the spindle has been developed to a very high state of perfection. Ten thousand revolutions actual spindle speed, and a front roller speed of 150 by 1 in. diameter, or 471 in. delivered per minute, on say 30's counts, was quite a practicable speed, given a good ring, a good spindle, and an up-to-date machine.

The spinning of a cop in imitation of a mule cop on a constant spinning frame (not intermittent as a mule) had been the ambition of many inventors, notably Bourcart, Lancaster, John Tatham, Perkins and Wimpenny, and several others, but, for reasons which appeared to be obvious, with no practicable results.

Mule Spinning.

The yarn produced on the water twist frame was too hard and wiry to be suitable for weft therefore, at that period, the yarn was spun by hand wheel with a single spindle. These hand spinning wheels could not,however, keep pace with the production of the water twist frame, and the invention of the spinning jenny, by James Hargreaves in 1767, paved the way for the spinning of weft yarns in cop form suitable for placing in the shuttle of the loom. The earliest possible example of the jenny had about 30 spindles, and was worked by the spinner himself by means of a large rim wheel. The jenny had no rollers, and the draft or elongating or streching of the fibre, was a carriage draft only. This machine was, in fact, only the application of the functions of the spinning wheel from one spindle to a multiple of spindles, say, 32 spindles or more per spinner. The stretching or drawing out and the running in of the carriage, the twisting, the backing off, the winding on, and the building of the cop, were all done by the man at the wheel, who, one can well imagine had to be a clever man, and was really a spinner. The number of spindles, gradually increased to 80 spindles per jenny.

The "mule," which was invented by Samuel Crompton about 1779, was a great step in advance. He combined the roller drafting system of Arkwright, plus the carriage drafting or stretching of the Hargreaves jenny, and thus combined the advantage of both inventions, the most valuable of these being the additional draft from the rollers, plus the carriage stretch; whilst the putting in a slight amount of twist during the stretching, or drawing out of the carriage, tended to equalise the yarn in thickness, viz, to stretch the thick places and reduce them in thickness.

About the year 1792, Mr. W. Kelly, at that time manager of Lanark Mills,obtained a patent to work the mule by power. The mule then became the objective of many clever inventors, and was gradually evolved from the jenny to the mule, and from the mule to the self-acting mule. The technical books published about 1830, illustrated the Sharp, Roberts self-acting mule, which was patented in 1825, and had been the basis from which the mule of to-day had been brought to its present state of perfection.

Carding.

The perfection of the carding engine had been the objective of many inventors; it had been subjected in every detail to criticism from all concerned, with a view to greater perfection of its various details, and it was difficult to imagine in what direction further improvements of any importance can develop. The revolving self-stripping flat system had survived all other systems, but many inventions and variations of methods for setting the flats had been tried, but the carding engine with the flexible bend had met general favour and was the most largely used.

Drawing Frame.

The modern up-to-date drawing frame, with its automatic front and back stop motions, its stop motions when the can was full, and its safety locking motion to prevent the draft gear being uncovered or exposed whilst the machine was working, appeared to be almost the perfection of mechanical ingenuity. A set of 3 by 3 deliveries (with rollers running at the maximum rate at which cotton of the various staples could be drafted to give production of a good quality), seemed to be about the full capacity for an ordinary female tenter, and it did not appear possible to improve the quality of work or to increase the output of the machine. There was a movement in this country at present to use cans of larger diameter, viz. 10 in. diameter instead of 9in. diameter, and in a few cases as large as 12in. diameter. There was something to be said for and against a move in this direction, one objection being the greater floor space occupied by the cans at back of the drawing frame—the greater spread of the cans being an inconvenience to the tenter, more especially if she be of small stature. This objection could be removed by the adoption of a staff or length of roller between the stands in proportion to the increased diameters of cans being that the greater increased contents of the cans resulted in fewer cans having to be moved about.

Slubbing, Intermediate and Roving Frames.

These machines were now made of a maximum number of spindles, which long experience had proved to be about as many as the average tenter could work with economical advantage, viz., in medium counts 100 slubbing,144 intermediate and 184 roving spindles, and a proportionatly greater number of spindles in frames with narrower spindle distances.

Any movement in the direction of higher spindle speeds was unlikely to occur, experience having proved that higher spindle speeds had a tendency to throw off the loose fibres of cotton unless extra turns of twist were put in to hold the roving or the threads together. This twist, if excessive was also detrimental to good drafting in the after processes. Increased speeds did not always give an increased output.

Spinning.

The continuous spinning frame, which in Arkwright's water twist frame contained about 96 spindles, was now made up to 600 spindles long, viz., 300 spindles, on each side, and an up-to-date ring spindle would run about eight times the speed of the flyer spindle in the Cromford Mill, therefore, the increased production of the present day, taking into account the better quality roving and the better spinning, must be enormous. The frame made in Thorpe's day had been improved in all directions, having a perfectly hardened and truly concentric ring, and a light weight spindle capable of running steadily at any speed at which the spinning could be done with economical advantage. Further improvements had been attempted in many directions, such as revolving rings, spindles running at varying speeds from the empty to the full bobbin, fixed ring rails and lifting spindles, but most of these devices had met with little or no success. We now appeared to have reached what might be considered maximum rates of speeds for the most economical results.

At the present time, when the Government of this country had decided upon raising the age at which children might commence work in the mills, it would appear that doffers would become scarce and costly, therefore they might expect to have some system of mechanical doffing brought to their notice in the cotton trade, as was already done for the flyer and cap frames in the worsted trade. The endeavours to produce on a ring spinning frame a cop in imitation of a mule cop, which was much to be desired for weft yarns, had been more or less successful—generally less.

Spinning the self-acting mule had been brought to a high degree of perfection; its best place was in the two extreme in spinning, viz.: the coarsest counts and the finest counts, more especially for the spinning of tender weft yarns.

The Hargreaves' jenny of 30 spindles only, followed by the mule and ultimately by the self-acting mule, which was the successor of both, had been left far behind, the self-acting mule for cotton spinning being now made up to as many as 1,350 spindles of 1¼in. spindle distance per mule. The width of the mills having, up to about 50 years ago, been gradually increased to accommodate mules of 1,000 spindles of 1¼in., whilst at the present time the mules are made 132 ft. or 44 yds. long, and about 1,350 spindles.

The mule and the mule carriage had been strengthened to meet the constantly increasing demands, the drawing out and running in of the carriage being normally steady in these present-day long mules, the limit of the most economical number of spindles being determined by the wages costs, not by the machine maker's ability to supply longer machines. The use of steel in place of wood carriages was being pushed to the front, principally on account of the difficulty of obtaining suitable timber, also as a protection against fire, and most of the principal mule makers were now making carriages of steel. The use of flexible spindle bolsters enabled higher spindle speeds to be run than possible with rigid bolsters, and the flexible bolster would probably be developed, and might come into more general use in the future

Having in the preceding pages taken a brief survey of the progress made in cotton spinning, from the early times of spinning of cotton on the factory system up to the present day, and noted the improvements which had been made year after year in the development and construction of the machines, it might be claimed that the system, as a whole, had attained a tolerable degree of perfection, and it was not unreasonable to suppose that any radical changes were not in near sight. The roller drafting at the present time was being the special study of several individuals, mostly on the Continent, with the object of obtaining very long drafts. Most of these were systems which have been tried years ago, and were being again revived. There was, however, a method of drafting on trial in which the ordinary middle roller—top and bottom—were supplemented with endless flexible leather bands, through which the cotton passed on its way to the front rollers. This method, which imitates the action of the finger and thumb in the hand-wheel spinning, when several disadvantages had been overcome, might have a successful future before it.

Important Details.

"Having therefore attained this position so far as the textile machinery is concerned, we must seek for greater economy in the many other important details of a first-class spinning mill. The principal points to which we should, in my opinion, pay more serious attention are—in mill building pay more attention to the value of taking the fullest advantage of the light which Nature provides. Anyone with an intimate knowledge of the large manufacturing towns will notice the mills, of five or more storeys in height, built close up to the foot path edge of a narrow ten or twelve-yard street, and in consequence artificial light has to be used to a much greater degree, and is a permanent expense; moreover, dark workrooms have a corresponding effect upon the tempers of the workers, who have to spend the longest part of their day in these rooms. It is well known that the electrical conditions of the mill structure, of the machinery, and of the influence of electricity on the delicate fibres of the cotton are an important factor in the preparing and spinning and in the resultant quality of the yarn. This fact is brought more forcibly to the mill-managers' notice in countries such as India, China, and Southern States, which have extremes of temperature and extremes of variation in the relative amount of humidity in the atmosphere. There are dry days when the film of cotton is so attracted to the filleting of the doffer that it refuses to leave it, and there are other days when the moisture is so excessive that the fleece of cotton is so weighted with moisture that it breaks between the doffer and the silver plate. The tendency for the fibres to lick round the front roller (bottom) and for the cotton to refuse to pass down the metal tubes or over metal plates is well known in all countries, and more or less succesful efforts have been made to minimise the evil.

"This subject has been dealt with very extensively for many years past by inventors and scientists

with more or less success, but the subject is so closely connected with the economical and practical working of a cotton mill that the relative amount of humidity in the atmosphere in the rooms of a cotton mill must has proved to be the best for the production of the most even and strongest yarn. The method of driving the machines requires careful consideration. An ideal mill would be one which, so far as practicable, there is no overhead driving which can be avoided. The use of belt driving is an inpediment to perfect distribution of light. It is a dirty fethod where clean cotton fibres are to be dealt with. It also varies, according to the conditions of the belts, in the power and speed transmitted to the machines. To keep the driving side of a belt in effective working condition necessitates the cleaning of the belts periodically. The doing of this and the brushing down of the shafting and the drums, cause dirt and fly to be thrown in the machines and black specks on the cotton and yarn.

Properly Arranged Mill.

"I think it will be generally admitted that given good steady electric generators, etc., the output per spindle will be improved both in quality and quantity. The economy of the adoption or otherwise of independent motor drive cannot be valued only by comparison with the cost of the instalation, but should be considered in connection also with the many advantages it possesses. The enormous cost of coal, and the probability that coal will remain much dearer than the pre-war price, will compel manufacturers to economise the use of it. The more extended use of automatic stokers, coal conveyers, and up-to-date methods of fuel economy is therefore advisable; and if the application of such appliances results only in a purer atmosphere in our manufacturing towns,it will have been worth doing. With a view to further economy in full and the power it produces, greater attention will be paid to the more extended use of ball or roller bearings in the construction of both machinery and shafting.

"The growing use of electricity for power purposes and the installation of large central generating plants will, in time, tend to solve these problems to the advantage of the mill owners, to the workpeople employed and to the townpeople generally. Nor should it be overlooked that in mill building and in the installation of the machinery therein it is a constant source of economy to have wider passages than have generally been considered necessary. The passages and the runway should, in every case, be sufficiently wide for the whole of the in-and-out traffic to move along with comfort and without interfering with each other.

"In conclusion, I would state that a properly arranged cotton mill and factory, one that is best adapted to be the most economical and efficient, does not consist in the building of a mill at the lowest possible cost, with the smallest possible space for light and free movement, and then filling it with the best machinery, but should consist in more than this, viz., a pure and a suitable atmosphere, light, the best method of ensuring cleanliness and comfort and health for the worker should all be carefully considered, as each of these combined will tend to a larger output, the production of better yarn and more contented workpeople, also to the advantage of all concerned."

TORONTO DISTRICT CONDITIONS.

By Our Toronto Correspondent.

Toronto, January 25th — Retailers are beginning to take note of the impelling features of the situation. This seems to be the outstanding factor in business movements here. Your correspondent was in New York the other day, and in the course of a stroll around the shopping districts, this appeared to be the case there, also.

A short flurry in cottons on Wall Street in the morning led to a fairly sharp come-back in the afternoon, closing prices slightly above previous close.

The reasons were obscure, presumably a further early decline in Liverpool and threatened labor difficulties in New England over the proposed wage-cut there. Another interesting development reflecting improved conditions, though somewhat of a seasonal nature, was the ending of the New York Garment Workers' strike yesterday. The cause of the strike was insistence by the employers on a forty-nine hour week and piecework. The workers return on a forty-four hour week basis with week-work.

Local cotton men repot mills busy and having orders on hand for two or three months. There is no boom on, just a fairly steady improvement in demand and largely in staple lines. Retail stocks in many lines must be quite low.

Hosiery mills are preparing for good business, and in some cases are actually working for stock or orders.

Cotton underwear business shows increased activity.

Silk is comparatively quiet, though the use of silk hosiery and underwear shows no signs of dimishing favor.

Wool — Travellers report good sales: quantities not large, but in some districts small orders from almost every tailor visited, and the demand is for higher qualities, in spite of the prices in England have increased from fourpence to a shilling and fourpence a yard.

Domestic wools have never been so low in the memory of the veteran wool men, but these show signs of improvement.

Fine wools are advancing sharply from day to day — especially Australian — greasy, burry being quoted at ninepence, and longer staples free from burrs up to a shilling and fourpence.

Dyes prices are tending downwards from day to day with increasing volume of European imports.

Conversation with wholesalers and jobbers in several lines of staples, cotton and woolen goods elicits that orders are coming in, or that the mills are preparing for expected orders, based on the view that stocks in retailers hands must be low.

NEWPORT CHEMICAL WORKS INC.

The Newport Chemical Works, Incorporated, has succeeded in duplicating the old pre-war Solamine Blue F F, which was also known as Diamine Fast Blue F F B, and is putting it on the market under the name of NEWPORT DIRECT FAST BLUE S F F.

This product, it will be remembered, was particularly desirable because it was extremely fast to light for direct color without being after-treated. It has very good fastness to washing, rubbing, weather, hot pressing, cross dyeing, etc. It is unaffected by the action of weak acids and alkalies, and is considerably used on fancy piece goods where the cotton is to be dyed and silk effects are to be left white. It will discharge to a pure white.

About Fabric Gloves.

Testing the Superiority of German & British Products.

(Special From Our London Corespondent.)

The pros and cons of the manufactures of British and German fabric gloves are at issue in London by parties representing English mills and importers of cotton and other fabric gloves from Germany and some plain speaking has been indulged in on both sides. No decision has yet been arrived at as to which country produces the best gloves.

Under the Safe-Guarding of Industries Act, particulars of which have already appeared in the "Canadian Textile Journal", a committee was set up to report to the Board of Trade, in London, on the general effect, owing to the consequences of the depreciation of the Mark, of the selling of German fabric gloves and glove materials in the United Kingdom at prices below those at which similar products could be profitably manufactured in United Kingdom Mills; also, whether unemployment was thereby being caused in the country's industry and if the country's glove making industry was being carried on with reasonable efficiency and economy, and how protection given by the Act — a 33 1-3 p.c. duty — would affect employment in other industries. Needless to say, the issues raised have interested a very large circle of manufacturers, Chamber of Commerce, politicans, and importers, and evidence has been adduced for and against the German imports. .

Challenges and Challenges.

This is the first time under the Act that manufacturers and importers were at variance. Formal evidence developed into challenges. Challenges were thrown back in return and then the question as to whether the Germans or the British manufactures were the best arose and some hard hitting followed.

"I challenge any man who knows his business", remarked Mr. W. Pinkham, National Glove Company, Essex, who wants a duty placed on German fabric gloves, "to say if he has ever bought a case of German gloves to beat these either in quality or in finish." The Committee glanced at the case of gloves; then the importers had their inspection. "Before the War", continued Mr. Pinkham, "the price was $4.2; today it is $7.80 and $6.42 for the cheapest. For the lower quality gloves the Germans are charging $1.20 to $1.44 per dozen less than English firms and for the higher qualities the German prices are $1.92 to $2.16 less. Aproximately the cost of labour in a dozen pairs of fabric gloves represents 70 to 75 p.c. — wages have doubled since and during the war."

A Manchester buyer of gloves srartled the Committee by declaring that the German gloves were superior in finish, turn-out, and general reliability. "English manufacturers", he added, "suffer from want of experience and a great lack of effort. There is no improvement in the home product and in buying English imperfect goods I have lost hundreds of sovereigns in disposing of them. English manufacturing firms that I do business with are all busy and with regard to the suede and silk gloves the Saxon article is not only vastly cheaper but superior."

A member of the Committee engaged in a little repartee with the Manchester buyer.

"Your report of evidence", observed the Committeeman, with a sigh, "is a very depressing document. You say the English have never succeeded in turning out a perfect glove, some have gone out of business, and others are too apathetic to come near you. Why do you oppose the application for a duty if they are so incompetent?"

The Buyer: Why put a premium on incompetence?

Committeeman: That is another question. Why do you opose it?

The Buyer: That is the only reason I can give.

Fabric Glove Industry In a Bad Way.

The Secretary of the North Devon Glove Manufacturers' Association told the Committee that, failing the establishment of a tariff which would permit of trading on a fair basis, the remaining factories in his district would be compelled to close down within twelve months and 2,500 workers would be idle. German gloves were sold in England at $3.90 a dozen and the actual cost of production, without profit, of a similar glove in England was $5.62 a dozen.. He estimated that Germany was able to manufacture the glove at $2.64 a dozen, while in England wages alone reached $3 a dozen for the same kind of glove, not to mention other manufacturing costs. German competition had compelled some English factories to close and this fact was borne out by a Leicester Manufacturer, whose firm employed 190 workers, with an output of 2,320 dozens a month, in 1919; today they had 20 workers with an output reaching 300 dozens a week — rates of exchange, no market prices for the German products, and English buyers being compelled to purchase German products — else, his neighbour would — caused the loss in orders and a reduction in the employed labour. .

Evidence in Favour of Germany.

Lancashire in many parts, it is claimed, will be most seriously affected if a duty is imposed on German products,because Lancashire cotton and yarn is used largely in Germany for the fabric glove industry.

Mr. A. E. Beydell, head of the Swan Lane Spinning Company, in Bolton, who has just been on a visit to Germany, told the Committee that 70 p.c., of his mill's production went to the Germans with whom his trade had developed since war ended. If a duty was put on yarn from England would be restricted in Germany. There were some people who thought the only spinners who were able to spin were in Lancashire. That was not so. There were other spinners who were able to supply yarn besides Lancashire. In Bolton, Lancahire) Mills were now working short time. If a duty were imposed Germany would not take it lying down. The Germans could obtain yarn elsewhere, possibly Switzerland and France, and ship gloves to America and Canada..

Mr. F. M. Heap, a director of Killington's, Manchester, put his views before the Committee. The undercutting of the British fabric glove by the Germans was not due to the exchange, he contended, and in his opinion there was no question but that in cut, finish and general turnout, thre was superiority in the German gloves. .

Sir H. Rew chairman of Committee: Do you suggest that gloves from Germany satisfy the demands of the British purchasers in cut and finish more than any British glove?

Mr. Heap: That would be too wide a statement.

Sir H. Rew: What proportion?

Mr. Heap: As regards the actual make — the bulk.

Sir H. Rew: Do you consider there are certain firms in this country that are putting on the market work equal to anything imported?

Mr. Heap: I am certain not.

A Hard Knock

Mr. E. Middleton, Messrs. Proctor and Co., London, gave the English firms in glove manufacture a very nesty "knock on the Knuckles". Armed with samples he first of all pointed out that the sales of gloves were 80 p.c. Saxon and 20 p.c. English. The Germans had been at glove manufacturing for 50 years and had mastered it Mr. Middleton then produced his samples of Saxon gloves and remarked that they were superior to English gloves. "I am certain", he exclaimed, "there is no English firm can compete with the German article for finish and quality and in my opinion that is the reason why many of the English firms are unemployed and their machinery idle."

This denouncement fell like a bomb on the manufacturers present at the inquiry, particularly as similar cotton and yarn is used by them — most German gloves being made from Lancashire cotton and yarn, the trade from Lancashire being greater than the English glove making industry as a whole.

Several other representatives of London firms stated that the German glove was easier to sell, much to their regret, and in quality and finish they beat the English glove.

The Board of Trade is now considering whether a 33 1-3p.c. duty should be placed on German falne gloves and probably sometime in the new year their result will be announced. The evidence for and against the duty is knothy and the decision of the Board is being awaited with much interest.

"ALLEGED SUPERIORITY OF GERMAN DYES".

Lecturing on "Wool in Relation to Dyeing" at a meeting of the West Riding Section of the Society of Dyers and Colourists, held in Bradford on Dec. 15, Mr. J. W. Radcliffe expressed the opinion that the Government had made a mistake in imposing restrictions on the importation of foreign dyes. With English dyes, he said, we did not obtain that brightness of colour which we got from the same classified German dyes. Our export trade inevitably suffered because our competitors, to whom the German dyes were freely available, were in a position to get better colour effects in cloths manufactured from the same qualities of raw materials.

In support of his contention, Mr. Radcliffe referred to the contracts now in the hands of several West Riding manufacturers for "mignonette" khaki for Serbia. The wools used for this material were, in the first instance, dyed separately in several shades, including blue, lavender, red, and indigo, and then, in the necessary proportions, blended to produce the colour required. When British dyestuffs had been employed, it was found, after the processes of milling and scouring, that the colour of the cloth was much flatter than was the case if German or Swiss dyes had been used. It was, perhaps, in the scarlet dye that Germany had the strongest advantage over our own products. Referring to "resist" dyeing, the lecturer said that yarns submitted to this process in England came up considerably weaker than those similarly treated on the Continent.

(Chemical Age.)

McARTHUR IRWIN LTD. HOLD ANNUAL CONVENTION.

The annual convention of McArthur Irwin Limited sole Canadian distributors of the Sandoz Chemical Works, was held at the head office of the Company St. Paul St., Montreal January 3-6 and was attended by all the executive and operative officials at the different plants of the company and their travellers from all over Canada.

The convention was opened with an address by Mr. John Irwin in which he dealt particularly with the firms business during 1921 and outlined possibilities for development during this year.

Mr. R. H. Monke, Vice-President addressed the convention on the Manufacture of White Lead and Paint. Other addresses were given by Messrs. G. Armstrong, W. T. Dickson and W. Reynolds.

MR. JOHN IRWIN,
President of McArthur-Irwin, Ltd.

MR. R. H. MONKE.
Vice-President of McArthur-Irwin, Ltd.

Asbestos Selvage Edge Tape

ITS MANUFACTURE AND GENERAL USES

By Roy A. Smith
(In "Asbestos.")

To the uninitiated, the thought of weaving a tape from a mineral seems absurd but this seemingly impossible feat is performed daily with some of the various types of minerals of the Asbestos group.

The most widely used type of Asbestos—Chrysotile—is a hydrous silicate of magnesia and is found in the Province of Quebec, in the belt that centers at Thetford Mines, where the majority of the world's supply is mined. There are, however, other sources of supply now being opened up—in Rhodesia, in China, New Zealand, Australia and Russia. The Canadian grades are used practically exclusively in our U. S. domestic market and this article will deal almost entirely with the usage of Chrysotile from the Canadian mines.

In the manufacture af various types of Asbestos Tapes different gradings of crude materials may be used. Where a fine tape is to be run it is necessary to use a long staple Asbestos, as it is essential that we secure good tensile strength with the required thickness. As the range in thickness goes higher, we may use a No. 2 Crude and for the manufacture of heavy tapes, such as Brake Lining, even use the so-called spinning fibres.

Foreign manufacturers seem to secure better results from the use of spinning fibres than do we on this side of the water. Their machinery is run at a much slower rate, giving them less resultant waste, and they are satisfied with a lower producing capacity per machine than are we over here. The American idea is to secure the greatest output possible, thereby lowering production cost and insuring prompt delivery to customers, regardless of a small percentage of wastage such as would appall Europeans. We Americans feel that we are justified in this loss from the premier grades because uses have been devised for the utilization of this waste, and the increase in machine production will offset the slight difference in costs.

Details of Manufacture.

Chasing or Crushing — Crude Asbestos after having been shipped from the mines is chased or crushed to break it down, separate any rock mass that might have adhered to the fibrous mineral, and enable the manufacturer to regrade his stock either manually or mechanically. The crushing of crudes for the manufacture of fine tapes is an art, and a question that apparently does not interest some of the manufacturers. Too much time cannot be spent on this phase of tape manufacture and at present too little is. It is absolutely necessary that the material has its full "life" in order to secure maximum value thruout the various operations.

Mixing—After having been crushed and regraded, the fibres are mixed with various percentages of cotton, (the percentage depending on the class of finished stock desired) on a picker. This cotton is added to the Asbestos during the manufacturing process, and the length and quality will vary according to thickness and uses of finished stock. For very fine tape we use a high class long staple cotton (Sea Island), it being necessary to add only a small percentage of this high quality to function properly. As the grades of Asbestos used become shorter, it is of course, imperative that a larger percentage of cotton be used in the mix, in order that the mass will have sufficient body to card. Very few of the manufacturers wish to cheapen their product, and under ordinary circumstances adopt a fifteen per cent cotton mix, as standard. For electrical work it is advisable that tape does not contain over four and one-half per cent carbon, combustion test.

Carding— The mixed material is now ready for carding. The machines used for this work are the same type as those used in carding of wool and cotton, with a slight change in card clothing. The processes are almost identical with those employed in the general textile industry, sloven being taken off on either a spool for mule spinning or small bobbins for frame spinning.

Spinning—Sloven, or finished carded stock is carried from the cards to mules or spinning frames for spinning purposes.

The mules are able to give a great production daily but will not handle a fine stock as well as the spinning frames. The wipping action of the mules has a tendency to break the strands of Asbestos and will not give a tight enough twist to the yarn to secure maximum strength. The yarn during the spinning process is wound on small cones or spools and is then ready for twisting.

Twisting—Single strands of spun yarn are taken from the spinners and racked on a twisting frame . This frame is used to twist two or more strands of yarn together according to the purpose to which the finished stock will be put. In the case of break lining, brass or copper wire strands are intertwisted with the Asbestos to give strength and body.

Warping—After having been twisted into the proper number of plies, the yarn is routed to the warpers. These warpers are large frames built to hold numerous spools and are filled with the material then entering the schedule of production. In making a warp, each strand is called a "pick" and the number of ends vary depending upon the type of material desired, and the width in which the tape is to be made. These ends are carried through to a large spool and wound on it to the desired length. The material is then warped or beamed, and is ready for the looms.

Weaving—Of all the phases in the manufacture of Asbestos Selvage edge tape, weaving is the hardest. For various sizes of tape we need certain size reeds. These reeds designate the number of picks per inch of warp in the finished tape. Care must be taken in their choice. The amount of tension put on beam is also a question of moment. Some looms have a greater "back drag" than others, and it is practically impossible to set a figure to strictly adhere to. When you consider that the elements of tensile strength of yarn entering into the warp, drag, weights, and above all, the general cussedness of Asbestos as a whole, feature in this semi-climax, you can readily understand that there can be no set principle of operation and that the big item of manufacture is the human element.

The actual operation is conducted on the same lines as the weaving of other textile fabrics, with perhaps a slight change in looms. The bobbins containing the woof are inserted in the shuttle, a lever pushed forward and the operation goes merrily on. The "genius" operating a tape loom has merely to watch ten or twelve pieces of tape, see that the warps have been properly

beamed, that the tension on beam is uniform thruout, that the bobbins are properly adjusted, that no ends break, that the selvage does not "draw," and that there are no imperfections in the woven material. Considering all of the above do we wonder why there are so few manufacturers of fine Asbestos Tapes in this country? Calendering and Inspection—The finished woven tape is cut from the looms and carried to the calenders and coilers. Inspection is again made at this point to insure the manufacturer that no imperfect material is being shipped.

The tape is wound on small "cops," the length of material per cop varying as to thickness and width. Several consumers have specifications covering the coiling of tape and these have to be strictly adhered to as their winding machinery will only accept coils of certain dimensions. This finished stock is now sent to the shipping department for final inspection and shipping.

Uses.

Electrical Field—In this country the bulk of all fine tape is used in the manufacture of electrical apparatus. The material used, of course varies in thickness and width according to the duties it must perform. Stock sizes of tape for electrical work are widths of ½", ¾", 1", 1¼" and 1½", with thicknesses of .015", .020", .025", .035", a slight variation in thickness (a plus or minus of .002") being allowed.

If the tape were excessively thick all size requirements of the electrical apparatus manufacturers will be thrown off and for this reason the electrical manufacturers insist on having their specifications rigidly adhere to. At times the Asbestos manufacturer feels that the consumer is rabid on this point, but when you figure that other material entering into the manufacture of motors and generators is machined to exactness, you can readily see that it is absolutely essential that the tape meet with their specifications as to size.

Asbestos tape is used on electrical windings where a heat enduring insulation is required, and it is usually placed on the outside to act as a binder, to which purpose it lends itself better than cotton. Thousands of pounds are used daily by the various manufacturers of electrical apparatus and commerce owes much to the mineral Asbestos.

Following the lead of the United States, in having the first electrically driven ships, other nations are considering electrifying their present equipment. This will give a big impetus to the manufacture of Asbestos tape as a large export market will be opened, either in the shape of electrical apparatus by the apparatus manufacturers or the purchase of tape by foreigners.

The rush to Alberta, Canada, for "Liquid Gold" has also opened up a good field for electrical apparatus and, incidentally, repair parts.

The new "Lakes to the Sea" waterways will ultimately be established, with the possibility of developing the most stupendous power scheme in the world, all of which will react to the benefit of the Asbestos market.

Cotton treated tapes have an advantage over Asbestos in that they are moisture proof and for this reason are used where mechanical strength and insulation are necessary, for example armature and field coils as well as transformer and motor coils,low-voltage armature coils etc. The Asbestos manufacturers might spend many a profitable hour in developing a tape with a higher mechanical strength, oilproof and moisture proof, at the same time keeping it flexible.

Mica shim and paper, or, in other words, a paper binder coated with shellac, and covered with thin sheets of mica built up in layers to the required thickness, is also used as an electrical non-conductor for windings. This material while hard to manufacture, will act as a resistant to heat under continued pressure. Asbestos tape will also function under these conditions and minimize the labor cost of installation.

Many of the electrical manufacturers and contractors have adopted Asbestos tape as a winding for buss bars, as owing to its ease of application, it is readily adaptable for this type of work.

Several of the large Public Utilities have used Asbestos tape, after exhaustive experimentation, in preference to other material as an insulating material for underground cables. For this class of work it has the advantage of withstanding climatic conditions without deteriorating and will outlast other classes of impregnated insulating materials. Asbestos is not affected by heat or cold, shows no deleterious effect from dampness and is fire resisting. For these reasons it is the best material that could be used for the above purpose.

The following reasons show clearly why Asbestos tape is preferred to the majority of insulating tapes as used in the electrical field where heat is a question of moment:

Armature Coils, Irregular shapes and forms of coils, cores, etc.	Heat resisting Ease of application Superiority of service Longevity of service
Buss bars	Heat resisting Ease of application Superiority of service.
Under ground Cables . . .	Heat Resisting Ease of Application. Shows no ill effects from climatic conditions Does not age.

Asbestos tape is also used in another phase of the electrical field, viz: the manufacture of electric ovens. The tape is used as a door insulation, and also to cover small exposed connections and insulate the heating units. These ovens are capable of developing and holding high temperatures and for these reasons it is imperative that only heat resisting insulating materials be used.

Gasketing Material— Asbestos tape is used as a gasketing material in the manufacture of Hydro-chloric and Nitric acids; in fact many of the chemical processes demand the use of Asbestos gaskets as, owing to their being both heat and acid resisting they are particularly well adapted for this type of work.

Laboratory—Asbestos tape, owing to its ease of application to irregular shapes, has been a boon to the laboratory. It can readily be wrapped around a flask, test tube, retort or whatnot. It can be used as a tie strap while fusing materials and has so many diversified uses that it is almost an impossibility to enumerate them.

Pipe Insulation—Many Europeans use Asbestos tape, in conjunction with Asbestos wick or rope, as a pipe insulation. The wick or rope is first wrapped around the pipe and the whole bound on with the tape. This class of covering has the advantage over moulded coverings in that it will withstand excessive vibrations, is more readily adapted to variable sizes of pipe in the same line and is easy to apply on bends. This type of insulation is used most extensively on submarines, stationary gas engine exhaust pipes, steam engines, motor boats, motor cars and during the war as exhaust

pipe covers on both the light and heavy tanks. It has been introduced into this country and used to some extent. Since the United States produces more launches and motor cars than any other nation of the world there is an exceptionally wide field open here for insulation of this character.

Glass Manufacture—Asbestos Tape is used by glass manufacturers for wrapping the tines of forks which they use for taking bottles, etc. out of their ovens. The forks are wrapped with this material in order that there will be no metallic contact with the glass in process of manufacture. Should an unwrapped fork be used there would undoubtedly be an enormous loss in breakage from unloading, etc.

Asbestos tape is also used to reinforce the paddles used in stirring the molten glass, as owing to the severe heat other materials that could be used commercially would not be acceptable for this type of work.

How Many Cotton Fibres To A Yard Of Cloth?

BY H. D. MARTIN

Of course all fabrics are made up of millions of tiny fibres. These vary in length from the very shortest to those of over one inch in length. They also vary in diameter from about 1-1000 of an inch up to possibly 1-10,000 of an inch. Strictly speaking the cotton fibre has two diameters i.e. one of thickness and one of width. This is because the cotton fibre is not perfectly round, but considerably oval or flatten. When we speak of the diameter of a coton fibre, what is meant, is the average dimension of the breadth and thickness. The fibre is also tubular. The cotton fibre is also larger in diameter and stronger at the end which is fastened to the boll, and grows slighthy smaller and weaker away from the boll.

The strength of a fibre varies from a few grains all of the way up to about 150 grains of breaking strength. And strange as it may seem the cotton fibre has the same tensile strength that a wrought iron filament possesses, when made into the same size and shape that the cotton fibre is made, and which is being matched and tested with the iron filament. Another peculiar characteristic of the fibre, is that it is more or less spiral or apparently possesses twist as though it had been twisted by machinery, with the exception that the spirals or twists are very irregular. These spirals vary from very few up to over 100 per inch. Still another very interesting characteristic, is that the fibres possess a great affinity for one another All of these peculiarities taken together serve to make them easily assembled into threads. They cling and bind permanently. The spirals mesh in together closely. And as the fibres are tubular they compress slighty. This gives them the quality of holding together by springing back thus preventing the twists or spirals from slipping by one another. But, when in the loose state, as in slivers and roving strands, they can be readily drawn out and distribute themselves automatically into the close average size of yarn wanted.

How many of these fibres are there in a yard of fabric? This will depend upon the grade of cotton, length of fibre, and the kind of cloth into which the fibres enter.

Given the necessary items of information it is then not hard to compute, approximately, how many fibres there are in a yard of cloth.

We will take a yard of voile which runs ten (10) yards to the pound, made of 1 1-4" staple cotton, and the diameter of which will be about 1-6000 of an inch after being compressed and twisted into yarn. The yarn number wil be 60 for the average warp and filling.

The average diameter of number 60 yarn is 1-224 of an inch. This yarn will run 50,400 yards per pound of cotton or 1,814,400 inches.

As the diameter of this yarn is 1-224 of an inch, and the fibres are 1-6000 of an inch in diameter, it will take as many fibres to compose one strand of yarn as that which will equal 1-224 ÷ 1-6000 = 27. This quotient shows that there are in round numbers, 27 fibres of 1-6000 of an inch in diameter necessary to make a strand of number 60s yarn and which is 1-224 of an inch in diameter. As a thread of this yarn is spun 1,814,400 inches in length per pound, and as this long thread is composed of 27 fibres we must multiply this length by 27 which gives us 48,988,800 inches of fibres — if they were placed end to end. This is equal to a distance of 773 miles of fibres. Our next operation is to divide this total number of inches by the length of the staple — 49,988,800 ÷ 1 1-4 = 39,191,040. As this total number of fibres is made in to 10 yards of cloth 1-10 of the above or 3,919,104 is the number of fibres which are combined to make a yard of common dress voile.

By the above rule, and taking into consideration the grade of cotton and the length of the staple, yarn number and the yards per pound, any mill man can mark out this problem, thus ascertaining, as nearly as can be learned, the approximate number of fibres in any piece of cloth. If the cloth is 30 inches wide, and it is desired to find out how many fibres there are in one square inch of cloth, the rule is as follows: Multiply the width by 36 (the yard length) 30 x 36 = 1080. Now if there are 3,919,104 fibres in one yard of this cloth, in one square inch there will be as many as 3,919,104 ÷ 1080 = 3,629 fibres in one square inch of the above cloth. A good way to ascertain the exact diameter of the fibres, is to examine the number of fibres which compose the strand of any number of yarn. This can be done with a microscope.

The diameter of any yarn number is found by multiplying the yarn by 840 and then extracting the square root of the product, thus: #60 x 840 = $\sqrt{50400}$ = 224 +. This quotient equals the number of threads or ends of this yarn which can be placed into one inch of space, side by side. Therefore one of those ends equal 1-224 of an inch, and represents the diameter of #60 yarn. Now if a strand of this yarn is examined under the microscope, and if it is found that there are 27 fibres bound together to make up this strand, a single fibre will be 27 times finer or smaller in diameter than the diameter of the strand of yarn is. Therefore to ascertain the fibre diam, we must multiply the yarn diameter by the total number of fibres composing same thus: 1-224 × 27 = 1-6048 of an inch which is the diameter of each fibre as averaged.

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VALUE OF WOOL.

British Anticlpate Broader Export Markets and Stabilized Exchange.

Certain features of the wool trade of 1921 stand out in a striking manner, says a despatch from Bradford (Eng.) to the Toronto Globe. As the year closes there is every prospect of wool values being maintained, and of all the wool coming forward, particularly anything of merino quality, being absorbed without difficulty. The most noteworthy announcement during the year with regard to wool supplies was that by the Bristol Australian Wool Realization Association to the effect that the quantity of merino wool consumed during the year ended October 31 was 500,000 bales more than what had been produced in that period, and that, if the present demand is any indication of the future, all the good combing merinos wil be readily absorbed without depreciation from prices currenta to-day.

Throughout the year it has been possible to buy wool in Australia at more reasonable figures than were being paid in London. There has been lack of harmony between prices current in Bradford for the combed article and those realized for the raw wool in Coleman street. The difference between the cost of wool in London and in Australia needs to be taken into account before one can appreciate the meaning of the wide range of prices in wool and tops, particularly the latter.

When raw material values were on the down grade, nobody had any confidence in them, but as soon as a recovery began to be seen a rapid change came over the top market. This movement really had its inception in August, up to which time raw material values had not shown any very decided upward move, but the incoming of new buying orders, particularly on American account, resulted in distinct firmness being introduced.

Sales of tops at low prices (ranging around 2s 6d per pound) appeared to be the signal for the rise in values. Since that cheap selling was done there has been a large inflow of new business in tops and yarns, and now an average 64's top is worth around 4s per pound.

As soon as the German reparation terms are definitely adjusted and when the rate of exchange between Germany and this country can be rearranged so as to make export business to the latter country easier there will be a tremendous amount of business. The stabilization of exchange will affect Russia as well as Germany, for it will enable a multitude of buyers in the former country to come into the market. This is the chief hope for the recovery of the trade in crossbred wool and tops. It is pretty certian that merino goods will lose none of their present popularity.

The position among spinners and manufacturers during the year has been dominated by absence of demand for fully made goods and dearness of stocks on hand. Wholesalers and retailers have been struggling under a tremendous burden, and there is no doubt the decline in raw material values during the first half of the year told severely against them. The result was that manufactured fabrics, which had been bought at boom prices, moved very slowly, and though these stocks have been gradually reduced, this has only been done at tremendous losses.

The stabilization of raw material value has not come a single moment too soon, though the necessity for

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reasonable production costs remains, and so long as manufacturers are prepared to offer new goods on a basis corresponding to the present cost of the raw material, there is every probability of a reasonable turnover.

Only a few weeks ago the position among spinners was deplorable, short time and standing spindles being the order, but now a large number have enough work to run fifty five and one-half hours a week, and the whole outlook from a manufacturing point of view is now decidedly encouraging.

BRITISH WOOLLEN MEN HERE

A general plea for inter-Empire trade, coupled with a suggestion that Scottish woollen traders should push their business here, even if, on account of tariff, they have to establish Canadian branches, was made by Sir Charles Gordon, president of the Dominion Textile Company, Limited, at a luncheon which was extended last Tuesday at the Windsor Hotel to delegates of the Scottish Woollen Trade Mark Association, Limited, by the Canadian Association of British Manufacturers and their Representatives, Montreal branch. Following a reference to the close connection that existed between North Britain and Canada in relation to such well-known names as Mackenzie, Strathcona and Mount Stephen, Sir Charles Gordon expressed regret that the visiting delegation was to spend only six days in Canada, while thirty days would be spent in the United States, In Canada, he said, they were big enough to be able to wish them success in going after all the business they could get, and another reason for welcoming them was that Canada wished to be known a great deal better on the other side as to the opportunities that this country offered.

Sir Charles Gordon spoke of his experiences at Washington during the war when he was director-general for war supplies for the French Government; at which time he had noted the way in which a tremendous amount of raw material and manufactured commodities which Great Britain required had to be obtained from foreign countries. He urged that such countries as Australia, New Zealand, South Africa and Canada were able to supply these commodities, and that if they would create the trade, the Empire could be self-contained. Then in the matter of general community of interests, there was need of a common policy for immigration, shipping, finance and other matters, all of which should be so unified as to keep within the Empire the commodities and the powers that the Empire had, rather than distributing them to foreign countries as had been done in the past. In the past the British investor had been too ready to invest just wherever he could get the quickest return; but the war had shown the mistake of that policy, when Britain was in difficulties about such things as deposits of iron, aluminum and antimony.

Canadian Tariff.

As to whether the visitors would be successful in their trip from their own point of view, Sir Charles Gordon did not know, since Canada had a tariff against woollen goods as high as 30 per cent. He begged to remind them, however, that Canada was peculiarly placed with a big industrial country to the south. It was impossible to make of Canada an all agricultural country, and if industry did not offer opportunities, men would cross the border. So although he was not a believer in high tariff, he felt that in order to preserve and protect the interests of this country, there must be a protective tariff for many years to come. He wished to suggest that if they thought there was an opportunity for trade here, they should open branches here. So far as Canada was concerned, he looked for development within the next ten years, with British capital flowing in. Two outstanding needs were more immigration and export markets, the latter being all the more needed on account of the recent action of the United States.

George B. Fraser, of Greenshields, Limited, spoke briefly of the benefit of the trade mark of the Scottish Woollen.

Views of Delegation.

Replying for the delegation, W. Thow Munro, of Munro and Company, Edinburgh, reciprocated the sentiments that had been expressed as to Canada and Scotland, and he agreed with the previous speaker as to the future of Canada. He spoke of the difficulty of securing protection against false Scotch woollens, and at the same time declared that they would not lower their standards in order to compete with inferior goods.

C. J. Glenny, of Wilson and Glenny, Ltd., Hawick, also spoke of the efforts they were making to protect their products, stating that the trade mark had been registered in seventy countries.

BORNE, SCRYMSER REPRESENTATIVES

Following the recent death of James G. Burnes, the Borne, Scrymser Co., petroleum products, New York, has appointed Austin M. Knight to cover the southern part of New England, and Percy Morningstar the northern part of that territory for the sale of wool oils.

W. C. MURPHY ON TOUR.

Wiliam C. Murphy, president of the Providence Mill Supply Co.,. Providence, R.I., is spending a five months' trip in India and China. As president of the Providence Mill Supply Co., Mr. Murphy succeeded Antonio Spencer, who resigned to devote his attention to United States Ring Traveler Co., Providence, and the William H. Haskell Co., Pawtucket.

COTTON WASTE DEVELOPMENT.

L. A. Porritt of W. Tatham, Ltd., England, manufacturers of cotton spinning machinery, arrived in the United States last month. Mr. Porritt will remain in this country in the interest of his firm for a strenuous campaign among cotton mill men planning to give them interesting and important information concerning various expedients in utilizing their cotton waste.

ATLANTIC DYESTUFF Co.

The Atlantic Dyestuff Company will begin to make shipments of their new Atlantic Patent Black from their new works at Portsmouth, N. H., very shortly. This Sulphur Black is noted for its excellent solubility, brilliancy and strength and it will leave the fibre in a very soft condition.

SOME USEFUL CALENDARS

Edward Jefferson, importer and dealer of worsted, woolen and cotton machinery, has issued a daily wall calendar. The large numerals on the separate sheets add much to the usefulness of an office calendar.

A very serviceable calendar is distributed by the Curtis and Marble Machine Co., Worcester, Mass. Reproductions of the various types of machinery manufactured by the company head each calendar sheet, the latter being of heavy and durable glazed paper.

INDEX TO MILL SUPPLIES

Acid-Resisting Paint:
McArthur, Irwin, Limited
Dominion Paint Works Ltd.
Canadian Johns-Manville Co., Ltd.
Albone:
The Roessler & Hasslacher Co.
Aniline Oil:
British Dyestuff Corporation Huddersfield Ltd.
A. Klipstein & Co., Ltd.
McArthur, Irwin, Limited
Aniline Dyes:
Atteaux Dyestuffs & Chemicals Co., Limited
British Dyestuff Corporation Huddersfield Ltd.
L. B. Holliday & Co., Ltd.
A. Klipstein & Co.
Geigy Company, Inc.
Pollack Brothers & Co.
McArthur, Irwin, Limited
Sharpe C. A. Ltd.
T. D. Wardlaw & Son
Automatic Feeds for Cotton and Wool:
Jefferson, Edward.
Leigh & Butler.
Saco-Lowell Shops.
Sargent's C. G. Sons Corp.
Whitin Machine Works.
Automobile Gears:
Diamond State Fibre Co., Canada, Ltd.
Bagging Machines:
Sargent's C. G. Sons Corp.
Baling Presses:
Bredannaz, Louis & Son.
Barrels:
Diamond State Fibre Company.
Baskets:
Diamond State Fibre Company.
Beamers:
Crompton & Knowles, Loom Works
Saco-Lowell Shops.
Belting:
McLaren, The J. C., Belting Co., Ltd
Belt Dressing:
McLaren, The J. C., Belting Co., Ltd
Bleaching Powder:
Atteaux Dyestuffs & Chemicals Co., Limited
McArthur, Irwin, Limited
Can. Salt Co., Windsor, Ont.
Nichols Chemical Company
Bleaching Materials:
Atteaux Dyestuffs & Chemicals Co., Limited
A. Klipstein & Co., Ltd
McArthur, Irwin, **Limited.**
The Roessler & Hasslacher Co
Nichols Chemical Co., Limited
Sharpe C. A. Ltd.
Boards:
Diamond State Fibre Company.
Bobbins, Spools, Shuttles, Etc.:
Canada Spool and Bobbin Co
Jefferson, Edward.
Leigh & Butler.
Watson, L. S., Mfg., Co.
Boxes—Fibre:
Diamond State Fibre Co., Canada, Ltd
Boiler Graphite:
Dominion Paint Works Ltd.
Boiler Feed Water Purifiers:
Scaife, Wm. B., & Sons Co
Brick Paint:
McArthur, Irwin, Limited
Sharpe C. A. Ltd.
Brushes, Steam:
David Gessner.
Jefferson, Edward
Burr Pickers:
Jefferson, Edward.
Leigh & Butler.
Sargent's, C. G., & Sons.
Cans:
Diamond State Fibre Company.
Canvas Waterproofing Paint:
Dominion Paint Works, Ltd
Carbonizing Machinery:
East Jersey Pipe Corporation.
Jefferson, Edward.
Sargent's, C. G., & Sons
Tolhurst Machine Works.
Whitehead, Emmans, Ltd.
Card Clothing:
Bredannaz, Louis & Sons
Crabb, Wm. & Co.
Leigh & Butler.
T. D. Wardlaw & Son
Watson, L. S. & Co.
Card Grinding Machinery:
Leigh & Butler
Roy, R. S. & Son Company
Saco-Lowell Shops
Whitin Machine Works.
Carding Machinery:
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Leigh & Butler.
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Carpet Machinery:
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Saco-Lowell Shops.
Caustic Soda:
Canadian Salt, Co.
Atteaux Dyestuffs & Chemicals Co., Limited
McArthur, Irwin, Limited
Nichols Chemical Company
Whitin Machine Works.
Centrifugal Dryers:
East Jersey Pipe Co.
Imperial Trading Co.
Watson, Laidlaw Co.
Tolhurst Machine Works.
Chemicals:
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Dow Chemical Co.
A. Klipstein & Co., Ltd
McArthur, Irwin, Limited
Nichols Chemical Company
Sharpe C. A. Ltd.
The Roessler & Hasslacher Co.
Chloride of Lime:
Atteaux Dyestuffs & Chemicals Co., Limited
Canadian Salt Co.
Grasselli Chemical Co.
A. Klipstein & Co., Ltd.
McArthur, Irwin, Limited
Nichols Chemical Co.
Sharpe C. A. Ltd.
Watson, Jack & Co., Ltd.
Cleaning Waste Machinery:
Jefferson, Edward.
Leigh & Butler.
Tatham, Wm., Ltd.
Watson, Jack & Co., Ltd.
Whitin Machine Works.
Clutch Linings:
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Canadian Johns-Manville Co., Ltd.
Cloth Presses:
Gessner, David.
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Jefferson, Edward.
Leigh & Butler.
Philadelphia Textile Machinery Co
Gessner, David.
Whitin Machine Works.
Combs—Fibre:
Diamond State Fibre Co., Canada, Ltd.
Concrete Paint:
McArthur, Irwin, Limited
Sharpe C. A. Ltd.
Concrete Floor Hardeners:
McArthur, Irwin, Limited
Cooling and Conditioning Machine:
Jefferson, Edward.
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Jefferson, Edward.
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Cotton Machinery:
Crompton & Knowles Loom Work
East Jersey Pipe Corporation.
Draper Corporation.
Foster Machine Co.
Jefferson, Edward.
Klauder Weldon Dyeing Mach. Co
Lamb, J. K., Textile Machinery Co
Leigh & Butler.
Roy, R. S. & Son, Company
Saco-Lowell Shops.
Stafford Co., The
Tolhurst Machine Works.
Wildman Mfg. Co.
Whitehead, Emmans, Limited.
Whitin Machine Works.
Cotton Openers and Lappers:
Leigh & Butler
Saco-Lowell Shops.
Whitin Machine Works.
Cotton Waste Machinery:
Jefferson, Edward.
Leigh & Butler.
Saco-Lowell Shops.
Whitin Machine Works.
Cotton Yarn Dyers:
Saco-Lowell Shops.
Crayons:
Lowell Crayon Co
Cylinder Covering:
Dodge, C. S.
Dobbles:
Crompton & Knowles Loom Works
Conditioning Machines:
Jefferson, Edward.
Covers, (Roller):
Diamond State Fibre Company.
Delivery Cases:
Diamond State Fibre Company.
Damp-proofing Paint:
McArthur, Irwin, Limited
Drawing Frames:
Saco-Lowell Shops.
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Leigh & Butler.
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Drying Machinery:
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East Jersey Pipe Co.
Imperial Trading Co.
Watson, Laidlaw Co.
Jefferson, Edward.
Leigh & Butler.
Sargent's, C. G., & Sons.
Saco-Lowell Shops.
Tolhurst Machine Works.
Stephenson, Harry
Duck Machines, Cotton:
Gessner, David.
Dyeing, Drying, Bleaching and Finishing Machinery:
East Jersey Pipe Corporation.
Hussong Dyeing Machine Co.
Jefferson, Edward.
Klauder-Weldon Dyeing Machine Co
Klipstein, A. & Co.
Leigh & Butler.
Philadelphia Textile Machinery Co
Saco-Lowell Shops.
Roy, R. S. & Son, Company.
Tolhurst Machine Works.
Whitehead, Emmans, Ltd.
Dye Sticks:
Klauder-Weldon Dyeing Machine
Dyestuffs and Chemicals:
Atteaux Dyestuffs & Chemicals Co., Limited
American Dyewood Co.
British Dyestuff Corporation Huddersfield Ltd.
Benson, W. T., Co.
Dow Chemical Co.
Geigy Co., Inc.
Grasselli Chemical Co.
L. B. Holliday & Co., Ltd.
A. Klipstein & Co., Ltd.
Kuttroff, Pickhardt & Co., Inc.
McArthur, Irwin, Ltd.
Marston, John P.
Nichols Chemical Co.
Pollack Brothers & Co.
Sharpe C. A. Ltd.
Stamford Mfg. Co.
T. D. Wardlaw & Son
Watson, Jack & Co., Ltd.
Dyewood Extracts:
Atteaux Dyestuffs & Chemicals Co., Limited
Imperial Dyewood Co.
McArthur, Irwin, Limited
Newbert Color Co.
Sharpe C. A. Ltd.
T. D. Wardlaw & Son
Watson, Jack & Co., Ltd.
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Canadian Johns-Manville Co., Ltd.
Enamelled Conditioning Bobbins and Spools:
Leigh & Butler
Engineers:
Main, Chas. T.
Tolhurst Machine Works.
Extractors:
East Jersey Pipe Co.
Imperial Trading Co.
Watson, Laidlaw Co.
Tolhurst Machine Works.
Extractors, Full Width Vacuum:
Gessner, David.
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Diamond State Fibre Co.
Fibre Cans:
Jefferson, Edward.
Stephenson, Harry
Fibre Containers:
Diamond State Fibre Co.
Filters:
Scaife, Wm. B., & Sons Co
Finishing Machinery and Instal
Gessner, David
Fire-Retarding Paint:
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Canadian Johns-Manville Co., Ltd
Flute Rolls:
Jefferson, Edward.
Leigh & Butler
Saco-Lowell Shops.
Flyers:
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Leigh & Butler
Saco-Lowell Shops.
Whitin Machine Works
Fulling and Scouring:
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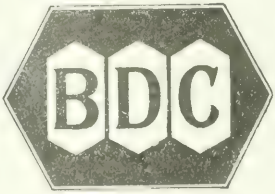

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Garnett Grinders:
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Gassing Machines (Yarn):
Foster Machine Co
Saco-Lowell Shops.

Gill Boxes:
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Leigh & Butler
Saco-Lowell Shops.

Gears—Waterproof, Noiseless:
Diamond State Fibre Co. of Canada, Ltd.

Glass Plate and Mirror:
Sharpe C. A. Ltd

Glass-Window:
Sharpe C. A. Ltd.

Graphite Paint:
Dominion Paint Works Ltd.

Harness and Frames:
Garland Mfg. Co
Steel Hedde Mfg. Co

Heddles:
Bredamaz, Louis, & Sons
Steel Hedde Mfg. Co
Watson Mfg. Co., L. S

Hosiery Transfers:
Kaumagraph Co

House Paint:
Canadian Johns-Manville Co., Ltd.
Dominion Paint Works, Limited
Harley-Kay, Limited
McArthur, Irwin, Limited
Scott & Williams
Sharpe C. A. Ltd
Dominion Paint Works Ltd.

Hydro-Extractors:
East Jersey Pipe Corporation
Imperial Trading Co.
Watson, Laidlaw Co.
Jefferson, Edward
Tolhurst Machine Works
Stephenson, Harry
Whitehead, Emmans, Ltd.

Insulation:
Diamond State Fibre Co., Canada, Ltd.
Canadian Johns-Manville Co., Ltd.

Hosiery Boards:
Harley-Kay, Limited
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Hot Surface Paint:
Dominion Paint Works, Ltd
Canadian Johns-Manville Co., Ltd.

Hydro Extractors:
Tolhurst Machine Works.

Hoisguards:
Crompton & Knowles Loom Works

Knit Goods, Finishing Machines, Crochet, Etc.:
Merrow Machine Co., The
Spindler, E. O.

Knitting Machinery:
Crane Mfg. Co.
Dubied, Machinery Co
Harley-Kay, Limited
Spindler, E. O.
Stafford & Holt.
Tompkins Bros.
Scott & Williams
Wildman Mfg. Co.

Knitting Needles and Supplies:
Harley Kay, Limited
Spindler, E. O.
Wheeler, Charles E. & Son

Logwood Extract:
Atteaux Dyestuffs & Chemicals Co., Limited
The Roessler & Hasslacher Co
A. Klipstein & Co., Ltd
McArthur, Irwin, Limited
Sharpe C. A. Ltd.
American Dyewood Co.
T. D. Wardlaw & Son
Watson, Jack & Co., Ltd

Loom Drop Wires:
Greist Manufacturing Co., The

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Garland Mfg. Co.

Looms:
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Leigh & Butler
Stafford Co., The
Stephenson, Harry

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Harley Kay, Limited

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East Jersey Pipe Co.
Whitehead, Emmans, Ltd.

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Measuring Machines:
Gessner, David
Jefferson, Edward
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Kilgour-Watson Drawing Machine Co.
Saco-Lowell Shops.

Mill Supplies:
Bredamaz, Louis & Son
Crabtree, Wm. & Co.
E. H. Jacobs Mfg. Co.
Garland Mfg. Co.
Jefferson, Edward
Watson Mfg. Co., L. S
Mallinson, J. C. Belting Co., Ltd.
Dominion Paint Works Ltd

Napper Roll Grinders:
Roy, R. S. & Son, Company
Leigh & Butler

Napping Machinery:
Gessner, David
Jefferson, Edward
Leigh & Butler
Roy, R. S. & Son, Company

Netting Machines:
Dubied, Edwards & Co
Spindler, E. O.

Oils, Lard, Etc.:
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McArthur, Irwin, Limited

Oils, Soluble:
British Dyestuff Corporation, Huddersfield Ltd.
A. Klipstein & Co., Ltd
McArthur, Irwin, Limited

Overseaming Machines:
Dubied, Machinery Co
Merrow Machine Works
Spindler, E. O.

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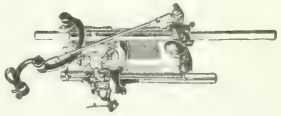

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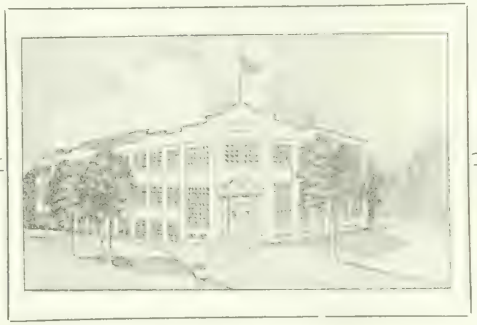

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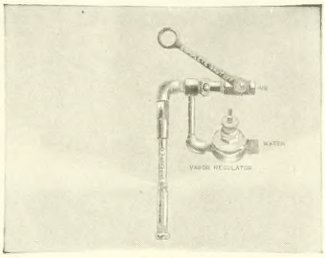

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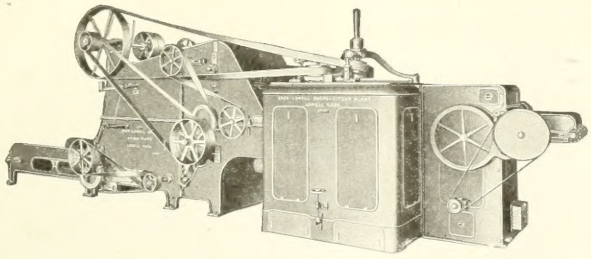

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